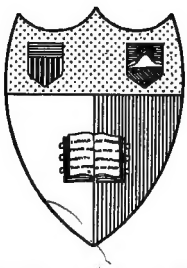

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BRITISH LICHENS

A MONOGRAPH

OF THE

BRITISH LICHENS

A DESCRIPTIVE CATALOGUE

OF THE SPECIES IN THE

DEPARTMENT OF BOTANY, BRITISH MUSEUM

PART II.

BY

ANNIE LORRAIN SMITH, F.L.S.

LONDON

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PREFACE

THE long interval in time between the publication of Parts I. and II. of the Monograph of British Lichens has been caused by the continued ill-health and ultimate death of the Rev. James Crombie, the author of Part I. Mr. Crombie had determined, and partly arranged, a number of specimens, and had also begun to prepare descriptions of the genera and species for Part II., when the work was finally interrupted by his death in 1906. His collections, together with his MSS., were generously presented to the Trustees of the British Museum by Mrs. Crombie, and I was fortunately able to arrange with Miss Annie Lorrain Smith to continue the work. In the preparation of Part II. Miss Smith has followed the form and arrangement adopted in Part I., except where divergence seemed absolutely necessary.

A. B. RENDLE.

DEPARTMENT OF BOTANY,
BRITISH MUSEUM (NATURAL HISTORY),
CROMWELL ROAD, LONDON, S.W.

February 1911.

INTRODUCTION

In the preparation of Part II. of the Monograph of British Lichens I have incorporated, as far as possible, the work previously done by Mr. Crombie, and the classification adopted follows, for the most part, the main lines of that projected by him in the first volume. Any discrepancies between the sequence of orders and genera and that outlined in the Synopsis in Part I. are explained where they arise. The "Natural Orders" under which the genera are classified correspond with the "Families" recognised by A. Zahlbruckner in Engler and Prantl's Pflanzenfamilien. In Mr. Crombie's Synopsis the "Families" represent the first grade of division of the Lichens and are sub-divided into series, tribes and genera. In Part II. the term "Natural Order" has been employed to avoid confusion, and, at the same time, to bring the Monograph into line with recent systematic methods.

According to modern views, more importance is assigned to the microscopic structure of the fruit than was allowed by Nylander and Crombie in their scheme of classification. The systematic value of the form, colour and septation of the spores had, however, already been recognised by Massalongo and other continental Lichenologists, and by Mudd in our own country.

I wish to acknowledge my great indebtedness to the Staff of the Botanical Department of the British Museum, especially to Dr. Rendle, Mr. A. Gepp, and Mr. W. Carver, for advice and assistance generously given during the progress of the work, and to Dr. A. Zahlbruckner, of Vienna, who has kindly advised me on some points of nomenclature. I have to thank Mr. A. W. Dennis who brought to me the first specimens of *Gongylia viridis*, collected by Mr. B. W. J. Starling. For further new or rare specimens I am indebted to the Rev. D. Lillie, the Rev. W. Johnson, and the Rev. H. P. Reader, and to Messrs. E. M. Holmes, J. A. Martindale, J. A. Wheldon and A. Wilson. I wish also to thank Mr. P. Highley for the care he has shown in making the drawings for the plates which have been expressly prepared for this work.

ANNIE LORRAIN SMITH.

NOTE TO STUDENTS

The books and papers consulted in the preparation of this work are all cited in the text. Students are especially referred to the following important works on Lichenology :—

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Schneider, A., A Text-Book of General Lichenology. Binghampton, New York, 1897.

Olivier, H., Exposé Systématique et Description des Lichens de l'Ouest et du Nord-Ouest de la France. Paris, 1897.

Fünfstück, M., & A. Zahlbruckner, in Engler & Prantl, Die Natürlichen Pflanzenfamilien 1, 1*. 1898–1907.

Jatta, A., Sylloge Lichenum Italicorum. Trani, 1900.

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CATALOGUE

OF

BRITISH LICHENS.

PART II.

Family III. **LICHENACEI** (*continued*).

Tribe XVIII. **LECANO-LECIDEEI** (*continued*).

Subtribe IV. *THELOTREMEI* (*continued*).

67. **CONOTREMA** Tuck. Syn. N. Amer. Lich. i. p. 217 (1882). (Pl. 1.)

Thallus crustaceous, membranaceous, uniform; algal cells (*gonidia*) *Protococcus*. Apothecia urceolate, immersed, truncate-conoid at first closed then open, becoming plane, proper margin black, thalline margin thin, soon disappearing; spores long, cylindrical, colourless, multiseptate. Spermogones with simple sterigmata and oblong straight spermatia.

This genus is retained in the *Thelotremei* on account of the urceolate, double-walled apothecium. The spores are very distinctive.

1. **C. urceolata** Tuck. *l. c.*—Thallus glaucous, white or greyish, smooth, becoming wrinkled or cracked, membranaceous, limited by a black line. Apothecia small, black, urceolate, becoming sessile and prominent, whitish-pruinose or naked, with a thick, elevated margin; hypothecium blackish; paraphyses slender, lax, branched above, colourless; spores 8nate, elongate-cylindrical, maggot-like, somewhat arcuate, 30–40-septate, 0,100–160 mm. long, 0,003–5 mm. thick.—*Lecidea urceolata* Ach. Lich. Univ. p. 671 (1810); Cromb. in Journ. Bot. xiii. p. 141 (1875); Leight. Lich. Fl. ed. 3, p. 361.

Hab. On the bark of rather smooth trees.—*Distr.* Rare, only recorded from W. Scotland.—*B. M.* Airds, Appin, Argyll.

2. **C. homalotropa** A. L. Sm.—Thallus white, smooth, very thin, subdeterminate. Apothecia black, moderate, urceolate, becoming plane, prominent, with a thick elevated margin; hypothecium thin, blackish; paraphyses slender, lax, branched above, colourless; epithecium dusky, subrugose; spores 8 in the ascus, colourless, elongate-cylindrical, multiseptate, the septa at slightly irregular intervals, 0,130–140 mm. long, 0,0045–50 mm. thick.—*Lecidea homalotropa* Nyl. in Flora l. p. 329 (1867); Cromb. Lich. Brit. p. 90; Leight. Lich. Fl. p. 337; ed. 3, p. 361.

Very closely resembles the preceding, but differs slightly in the apothecia, which are generally plane, larger and somewhat rugose.

Hab. On the bark of old ash trees.—*Distr.* Local and rare in S.W. Ireland.—*B. M.* Between Killarney and Kenmare, and on the Eagle's Island, Lake of Killarney, Kerry.

Subtribe V. *LECIDEEI* Nyl. in Flora lxv. p. 458 (1882).

Thallus foliaceous, squamulose, crustaceous or with upright podetia. Apothecia discoid or patellate, occasionally difform, with proper margin only; spores usually eight in the ascus, sometimes fewer or numerous. Algal cells (*gonidia*) *Chlorophyceæ*.

The *Lecideei* differ from the *Lecanorei* in the absence of any algal cells in the apothecia. There are four British Natural Orders:—

I. GYROPHORACEÆ. — Thallus leafy, expanded. See *GYROPHOREI* (Part I. pp. 321–334).

II. CLADONIACEÆ.—Thallus of two kinds: basal, of leafy squamules, and upright, of simple or branching podetia, which often open out into cup-like expansions (*scyphi*). See *CLADODEI* (Part I. pp. 107–181, 184–186).

III. CŒNOGONIACEÆ.—Thallus filamentous.

IV. LECIDEACEÆ. — Thallus crustaceous or minutely squamulose.

Order III. CŒNOGONIACEÆ.

Thallus filamentous and byssoid in small patches, or forming widely spreading layers. Apothecia with a proper margin; asci 8-spored; spores colourless, simple or 1-septate.

Thallus with *Trentepohlia* gonidia. 68. **Cœnogonium.**
Thallus with *Cladophora* gonidia. 69. **Racodium.**

68. **CŒNOGONIUM** Ehrenb. in Horæ Physicæ Berol. p. 120 (1820). (Pl. 2.)

Thallus composed of loose branching filaments, usually brightly coloured. Algal cells *Trentepohlia*, forming a central

strand which is closely invested by irregularly branching fungal hyphæ. Apothecia apical or lateral, shortly-stalked, discoid, not carbonaceous; paraphyses discrete, unbranched, sometimes faintly septate; spores eight in the ascus, colourless, fusiform or elliptical, simple or 1-septate. Spermogones with fusiform straight spermatia.

This genus belongs almost exclusively to warm regions; it is represented in Europe by one species.

1. **C. ebeneum** A. L. Sm.—Thallus brownish-black, forming a wide-spreading soft felt of much-branched filaments which are constricted at short intervals; algal cells *Trentepohlia aurea*, surrounded by dark-brown fungal hyphæ which closely follow the outline of the alga. Apothecia not seen.—*C. germanicum* Glück in Flora lxxxii. p. 268 (1896). *Conferva ebenea* Dillw. Conf. t. 101 (1809). *Chroolepus ebeneus* Ag. Syst. p. 36 (1824); Hook. in Sm. Engl. Fl. v. p. 381. *Cystocoleus ebeneus* Thwaites in Ann. Mag. Nat. Hist. ser. 2, iii. p. 241, t. viii. B. figs. 1–3 (1849).

The species is probably not uncommon, and, in damp localities, it spreads extensively over the substratum in round patches or in a radiating fan-like manner. The thallus is often invaded by a whitish *Lepraria*, which grows in scattered granules over the older parts of the lichen. It has been frequently confused with *Racodium rupestre;* so that it is impossible for the most part to determine the plants recorded by the older writers. *Byssus petræa nigerrima fibrosa* (observed by R. Richardson) Dill. in Ray Syn. Stirp. Brit. ed. 3, p. 57, n. 8 (1724), and quoted in Dill. Hist. Musc. p. 9, t. 11 f. 18 (1741), may be either plant. *Byssus nigra* Huds. Fl. Angl. ed. 2, p. 606 (1778), Engl. Bot. t. 702, and *Dematium rupestre* S. F. Gray Nat. Arr. i. p. 588 (1821), share the same uncertainty. Filaments are occasionally found intermingled with the alga *Trentepohlia aurea*.

Hab. On rocks and stones, in shady localities.—*Distr.* Somewhat rare in Great Britain.—*B. M.* Llanymawddwy, Merioneth; Bridgenorth, Shropshire; Sychnant, Conway, Carnarvonshire; Bolton Woods, Yorkshire; Kirkconnel, Springkell, Dumfriesshire; near Killin, Perthshire; Loch Morar, Inverness.

69. **RACODIUM** Pers. Syn. Fung. p. 701 (1801). (Pl. 3.)

Thallus composed of loose, branching filaments, dark-coloured. Algal cells, *Cladophora*, forming a central strand, the fungal hyphæ growing in straight lines, and forming a closely investing outer sheath. Apothecia and spermogones unknown.

1. **R. rupestre** Pers. *l. c.*—Thallus brownish-black, felt-like, usually occurring in small patches, more rarely wide-spreading; filaments straight, not constricted, branched, fungal hyphæ very dark-coloured, obscuring the central algal strand.

As stated above, this plant has been frequently included with *Cœnogonium ebeneum* under the comprehensive name *Byssus nigra*.

Hab. On rocks in high latitudes.—*Distr.* Somewhat rare.—*B. M.* Agron, Cleveland, Yorkshire; Tarnbrook Fell, Lancashire; Aran Mawddwy, Merioneth; Kylemore, Connemara, Galway; near Killin, Perthshire; near base of Ben Cruachan and Ballachulish, Argyll.

Order IV. LECIDEACEÆ.

Thallus minutely squamulose or crustaceous, sometimes obsolete; algal cells (*gonidia*) *Chlorophyceæ*. Apothecia discoid or patellate with proper margin only; spores usually eight in the ascus, sometimes fewer or more, simple or variously septate, colourless or coloured. Spermogones immersed; spermatia elongate, elliptical or cylindrical.

This Order as defined above includes the Lichens classified generally under the single comprehensive genus *Lecidea* by Nylander in Mém. Soc. Cherb. v. pp. 119–127 (1837), by Leighton, Lich. Flora, pp. 248–358, ed. 3, pp. 240–389, and by Crombie, Lich. Brit. pp. 62–94 and in Grevillea xxii. pp. 8–11 and 57–60 (1893–4). The view held by early writers that the form of the spores is a character of generic importance, has been revived by recent lichenologists, and the species have been arranged according to spore characters in the following order :—

Apothecia cup-like, brightly coloured, marginate.
- Spores colourless, septate or muriform ..... 70. **Gyalecta.**

Apothecia discoid or patellate blackish or coloured.
- Spores colourless.
  - Spores simple.
    - 8 or fewer in the ascus ..... 71. **Lecidea.**
    - Many in the ascus ..... 72. **Biatorella.**
  - Spores septate.
    - 1-septate..... 73. **Biatorina.**
    - 3- or pluriseptate, fusiform ..... 74. **Bilimbia.**
    - Pluriseptate, acicular ..... 75. **Bacidia.**
- Spores brown.
  - 1-septate..... 76. **Buellia.**
  - 3-septate (parasitic) ..... 77. **Leciographa.**
- Spores colourless or becoming brown.
  - 8 in the ascus:
    - Muriform (sometimes 1–3-septate in species 1) ..... 78. **Rhizocarpon.**
  - 1 in the ascus:
    - Muriform, large ..... 79. **Bombyliospora.**
    - Elongate-pluriseptate, large ..... 80. **Lopadium.**

70. **GYALECTA** Ach. Lich. Univ. p. 30 (1810). (Pl. 4)

Thallus granular, pulverulent, or nearly obsolete; algal cells *Trentepohlia*. Apothecia brightly coloured, concave, with a prominent proper margin, somewhat urceolate-patellate; asci usually 8- rarely many-spored; spores variously septate, or muriform. Spermogones with almost simple sterigmata and straight rather short spermatia.

Apothecia closed at first, the margin (*exciple*) radiately fissured (PETRACTIS Fr. Summa p. 120 (1846)).

1. **G. exanthematica** Fr. Lich. Eur. p. 197 (1831).—Thallus effuse, very thin, continuous, greyish-white (K−, CaCl−), often obsolete. Apothecia small, immersed, pale-yellow or yellowish-flesh-coloured, the margin white, connivent, radiately (3–6) fissured, at length exposing the epithecium; hypothecium pale; paraphyses slender; spores 8nate, fusiform, 3-septate, 0,015–20 mm. long, 0,006–7 mm. thick; hymenial gelatine pale bluish with iodine.—*Lichen exanthematicus* Sm. in Trans. Linn. Soc. i. p. 81 t. 4. f. 1 (1791); Dicks. Crypt. fasc. iii. p. 14; With. Arr. ed. 3, iv. p. 22; Engl. Bot. t. 1184. *Thelotrema exanthematica* S. F. Gray Nat. Arr. i. p. 444 (1821); Hook. Fl. Scot. ii. p. 45 and in Sm. Engl. Fl. v. p. 161; Leight. Angio. Lich. p. 32, t. 12. f. 3; Tayl. in Mackay Fl. Hib. ii. p. 103. *Lecidea exanthematica* Nyl. in Mém. Soc. Cherb. v. p. 119 (1857); Cromb. Lich. Brit. p. 62; Leight. Lich. Fl. p. 334; ed. 3, p. 355. *Petractis exanthematica* Fr. Summa p. 120; Mudd Man. p. 278, t. 5. f. 117.

Exsicc. Leight. n. 256.

A very typical lichen, which has been referred by authors to several distinct genera and even tribes. It has frequently been regarded as *Thelotrema*, but, as Nylander observes (Mém. Soc. Cherb. t. iii. p. 181 nota), the hypothecium presents in the texture of its lateral portions no jointed filaments. The peculiar apothecia are characteristic of *Gyalecta;* they are at first closed, appearing as if verrucarioid, but at length become disciform, often disappearing in age, leaving numerous whitish depressions or pits on the substratum.

Hab. On calcareous rocks and cretaceous stones in upland, rarely maritime, tracts.—*Distr.* Not uncommon in England, rare in the S.W. Highlands of Scotland and in the N. and S. of Ireland.—*B. M.* Shiere, Surrey; Mount Harry, Fulking, and the Downs, Sussex; Torquay and near Babbicombe, Devon; Park Corner, Cirencester, Gloucestershire; Cunning Dale and Deep Dale, Buxton, Derbyshire; Eglwyseg Rocks, near Llangollen, Denbighshire; Ingleborough, Yorkshire; Eglestone and near Barnard Castle, Durham; Levens, Westmoreland; Lamplugh, Cumberland; Achosragan Hill, Appin, Argyll; near Belfast, Antrim; Kylemore Castle, Connemara, Galway; Killarney, Kerry.

Apothecia subbiatorine, concave, the margin typically entire. Spores 3- or pluri-septate and often variously divided.

2. **G. cupularis** Schær. Enum. p. 94 (1850).—Thallus effuse, very thin, continuous, subleprose, whitish or pale-greyish (K−, CaCl−). Apothecia moderate, superficial and prominent; epithecium impressed, concave, flesh-coloured or yellowish-red, the margin thickish, entire or at times radiato-striate, whitish; hypothecium colourless; paraphyses slender, not well discrete; spores 8nate, ellipsoid, 3- then multi-septate and muriform, 0,015–17 mm. long, 0,007–9 mm. thick; hymenial gelatine

slightly bluish then wine-red with iodine.—Mudd Man. p. 166, t. 3, f. 59; Leight. Angio. Lich. p. 33, t. 13. f. 1. *Lichen cupularis* Ehrh. Beitr. iv. p. 45 (1789); Dicks. Crypt. fasc. ii. p. 18; With. Arr. ed. 3, iv. p. 22 (excl. hab. "on trees"). *Lichen marmoreus* With. *l. c.* (1796) (excl. hab. "on trees"); Engl. Bot. t. 739. *Lecidea cupularis* Ach. Meth. p. 56 (1803); Carroll in Nat. Hist. Rev. vi. p. 525; Cromb. Lich. Brit. p. 62; Leight. Lich. Fl. p. 352; ed. 3, p. 381. *L. marmorea* Ach. Syn. p. 46 (1814); Hook. in Sm. Engl. Fl. v. p. 184 (1833); Hook. Fl. Scot. ii. p. 40 (excl. hab. "on trees"); S. F. Gray Nat. Arr. i. p. 473; Tayl. in Mackay Fl. Hib. ii. p. 129 (excl. hab. "on trees").

Exsicc. Leight. n. 122; Mudd n. 139; Cromb. n. 76; Larb. Lich. Hb. n. 186; Johns. n. 329.

A species not rightly discriminated by the earlier British authors from one or more of its corticolous allies. The thallus, which often spreads extensively, is occasionally almost evanescent. The numerous but not crowded apothecia are at first closed and subglobose, becoming at length explanate and concave; their margin is frequently radiato-rugose, especially in muscicolous examples.

Hab. On rocks, chiefly calcareous, and on mortar of walls, rarely overspreading mosses, in maritime, upland, and subalpine localities.—*Distr.* General and usually plentiful, where it occurs, in most parts of Great Britain; apparently rarer in N. and S. Ireland, as also in the Channel Islands.—*B. M.* Rozel, Jersey; Kymyal Cliff, near Penzance, Cornwall; Bathampton Downs, Somerset; Halling Hill, near Lewes, Sussex; Breda Hill, Leicestershire; Whitecliffe Rocks, near Ludlow, and Craig-y-Rhiw, Oswestry, Shropshire; Bilsdale and Guisboro' Moor, Cleveland, Yorkshire; Teesdale, Durham; Lamplugh, Cumberland; Island of Lismore and Appin House, Argyll; Craig Calliach, Ben Lawers, and Craig Tulloch, Perthshire; Cuchullin Hills, Isle of Skye; Craig Guie and Morrone, Braemar, Aberdeenshire; Grogans Glen and Colin Glen, near Belfast, Antrim; Ballaghbeama Gap, Kerry; Ballynahinch and near Erriff, Connemara, Galway.

3. **G. foveolaris** Schær. Enum. p. 94 (1850).—Thallus effuse, granulose or subleprose, whitish or greyish-white (K−, CaCl−), Apothecia moderate or somewhat large, urceolate, flesh- or pale-rose-coloured, the margin thin, entire or subcrenulate, paler; hypothecium colourless; paraphyses not well discrete; spores 8nate, oblongo-ellipsoid, 3-septate, 0,018–21 mm. long, 0,006–7 mm. thick; hymenial gelatine bluish then sordid with iodine.—*Urceolaria foveolaris* Ach. Meth. p. 149 (1803). *Lecidia foveolaris* Nyl. in Mém. Soc. Cherb. v. p. 119 (1857); Carroll in Journ. Bot. iv. p. 23 (1866); Cromb. Lich. Brit. p. 62; Leight. Lich. Fl. p. 334; ed. 3, p. 359.

Externally subsimilar to muscicolous states of the preceding, but quite distinct in the septation of the spores. As already noticed (Part I. p. 458) it also very much resembles, in the form of the apothecia and the spores, *Lecanora rubra*, from which, however, it at once differs in the absence of a distinct thalline margin. The apothecia are numerous but discrete.

Hab. Incrusting decayed mosses on the ground in subalpine and alpine regions.—*Distr.* Sparingly in Yorkshire and on the Grampians, Scotland.—*B. M.* Craig Calliach, Ben Lawers and Killin, Perthshire; Morrone, Braemar, Aberdeenshire.

4. **G. geoica** Ach. Lich. Univ. p. 31 (1810).—Thallus effuse, thin, subpulverulent, greyish (K−, CaCl−). Apothecia minute, urceolate, more or less immersed, pale yellowish-flesh-coloured, the margin entire, persistent, whitish; hypothecium pale; paraphyses somewhat coherent, clavate at the apices; spores 8nate, oblong or ellipsoid, 3-septate, usually 0,012–15 mm. long, 0,006–7 mm. thick; hymenial gelatine bluish then sordid-violet with iodine.— *G. Wahlenbergiana* Ach. Syn. p. 9 (1814); Leight. Angio. Lich. t. 13. f. 2. *G. foveolaris* Mudd Man. p. 167 (1861) (non Schær.). *Lichen geoicus* Wahlenb. in Vet. Ak. Handl. p. 142, t. 4. f. 5 (1806). *Lecidea geoica* Nyl. in Mém. Soc. Cherb. v. p. 119 (1857); Cromb. Lich. Brit. p. 62; Leight. Lich. Fl. p. 333; ed. 3, p. 359.

Exsicc. Leight. n. 123.

Closely related to the preceding, with which at times it has been confounded, but differs in the much smaller fructification and the shorter spores. The disc of the numerous at times aggregate apothecia often collapses in age, so that, as in other plants of this section, they appear whitish from the colour of the hypothecium.

Hab. On calcareous soil among rocks and on wall-tops in upland rarely maritime situations.—*Distr.* Very local in England and the Highlands of Scotland.—*B. M.* Cromer, Norfolk; Stiperstones and Whitecliffe Rocks, near Ludlow, Shropshire; Barcaldine, Argyll; Craig Calliach and Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire.

5. **G. truncigena** Hepp Flecht. Eur. n. 27 (1853).—Thallus effuse, very thin, subleprose, greyish, often evanescent (K−, CaCl−). Apothecia small, urceolate, pale reddish flesh-coloured, the margin thick, entire, whitish; hypothecium colourless; spores 8nate, oblongo-fusiform or oblong, 5–7-septate, usually with one or two longitudinal septules, 0,016–23 mm. long, 0,007–9 mm. thick; hymenial gelatine pale-bluish with iodine.—Mudd Man. p. 167, pro parte. *G. Wahlenbergiana* var. *truncigena* Ach. Lich. Univ. p. 152 (1810). *Lecidea truncigena* Nyl. in Mém. Soc. Cherb. v. p. 119 (1857); Cromb. Lich. Brit. p. 62; Leight. Lich. Fl. p. 352; ed. 3, p. 381.

Exsicc. Leight. n. 147; Larb. Lich. Hb. n. 188.

This plant was with the following confused by earlier authors under the name *Lichen marmoreus* with *L. cupularis*, to states of which it is externally subsimilar. It differs, however, in the smaller apothecia, the mode of division of the rather longer spores, and in the nature of the substratum. In the British specimens the thallus is often little visible, and the apothecia are somewhat scattered.

Hab. On the trunks of trees, chiefly elms and ash, in wooded maritime and upland tracts.—*Distr.* Sparingly in England and S.

Ireland.—*B. M.* Lyndhurst, New Forest, Hants; Ilsham, Torquay, Devon; near Penzance, Cornwall; Glynde, Hurst Wood, Tunbridge Wells, and Lavington Common, Sussex; Kemble, Gloucestershire; near Cambridge; Twycross, Leicestershire; Ingleby, Cleveland, Yorkshire; Castlemary, Cork; Killarney and Derryquin, Kerry; Tervoe, near Limerick; Dromoland, Clare; Curraghmore, Waterford.

6. **G. Flotovii** Koerb. Syst. Lich. Germ. p. 171 (1855).—Thallus effuse, very thin, subleprose, greyish, often evanescent (K−, CaCl−). Apothecia subminute, urceolate, pale-flesh-coloured, the margin thickish, entire, whitish; hypothecium colourless; spores 8nate, ellipsoid, irregularly submuriform, 0,011–13 mm. long, 0,008–9 mm. thick; hymenial gelatine pale-bluish with iodine.—*G. truncigena* Mudd Man. p. 167 (1867) pro parte. *G. Wahlenbergiana* var. *β* Leight. Angio. Lich. p. 86, t. 13. f. 3 (1851) (non Ach.). *Lichen tricolor* With. Arr. ed. 3, iv. p. 23 pro parte, t. 31. f. 6 (1796). *Lecidea querceti* Nyl. Lich. Scand. p. 191 (1861); Cromb. in Grevillea xii. p. 60. *L. Flotovii* Carroll in Journ. Bot. iii. p. 289 (1865); Cromb. Lich. Brit. p. 63; Leight. Lich. Fl. p. 353; ed. 3, p. 382.

Exsicc. Mudd n. 140.

Differs from the preceding, for which it is apt to be mistaken, in the smaller apothecia and in the form of the more divided, smaller spores. It is evidently the plant primarily intended by Withering as his *Lichen tricolor*, as appears not only from the specimens in his own herb. but also from his diagnosis—"saucers very minute, orange-coloured, deeply hollowed, like the cup of a Peziza, the border pale-brown."

Hab. On the smooth trunks of trees, elm and ash, in wooded upland tracts.—*Distr.* Local and scarce in England, N. Wales, the S.W. Highlands of Scotland and S. Ireland.—*B. M.* Near Glynde and Hurst, Sussex; Lustleigh, Devon; Stowell Park, Gloucestershire; Castle Moreton, near Malvern, Worcestershire; Bilsdale, Yorkshire; Levens Park, Kendal, Westmoreland; Barcaldine, Argyll; Blarney, Cork; Castleconnel, Limerick.

7. **G. corticola** A. L. Sm.—Thallus effuse, very thin, sordid-greenish (K−, CaCl−), often obliterated. Apothecia minute, concave, at length slightly prominent, pale-red or subtestaceous, the margin subconcolorous; paraphyses slender; hypothecium colourless; spores 24–32nate, fusiform, 3–7-septate, 0,016–34 mm. long, 0,005–7 mm. thick; hymenial gelatine pale-bluish with iodine.—*Pachyphiale corticola* Lönnr. in Flora xli. p. 612 (1858). *Lecidea congruella* Nyl. Lich. Scand. p. 191 (1861). Cromb. in Grevillea xxii. p. 8.

Externally somewhat similar to the two preceding species, but very distinct in the number septation and form of the spores. In the single British specimen gathered, which is only sparingly fertile, the thallus is but little visible.

Hab. On trunk of pine in wooded mountainous district.—*B. M.* Craig Calliach, Killin, Perthshire.

8. **G. carneolutea** Boistel Nouv. Fl. Lich. pt. 2, p. 178 (1902). —Thallus indeterminate, thin, smooth, continuous, white or glauco-whitish (K −, CaCl −). Apothecia small, subinnate, at first closed, then irregularly stellato-dehiscent with the epithecium at length nearly plane, yellowish flesh-coloured, the margin thin, whitish, lacerate or crenate, at length subobliterate; hypothecium pale; spores 8nate, oblong or lineari-oblong, 3-septate, 0,011–13 mm. long, 0,005–6 mm. thick; hymenial gelatine obsoletely bluish with iodine.—*Parmelia carneolutea* Turn. in Trans. Linn. Soc. ix. p. 145, t. 12. f. 2 (1808); Leight. Angio. Lich. p. 86, t. xiv. f. 2. *Lichen carneoluteus* Sm. Engl. Bot. t. 2010 (1809). *Rinodina carneolutea* S. F. Gray Nat. Arr. i. p. 454 (1821). *Lecanora carneolutea* Hook. in Sm. Engl. Fl. v. p. 191 (1833). *Lecidea carneolutea* Nyl. in Act. Soc. Linn. Bord. ser. 3, t. i. p. 347 (1856); Cromb. Lich. Brit. p. 63; Leight. Lich. Fl. p. 335; ed. 3, p. 357. *Lecania carneolutea* Mudd Man. p. 140 (1861).

Exsicc. Leight. n. 363; Larb. Cæsar. n. 30, Lich. Hb. n. 348; Cromb. n. 77.

In their earlier and more advanced stages of development, the apothecia closely resemble those of *G. exanthematica*, near which the species might almost be placed. The British specimens are well fertile, with the apothecia occasionally submoderate in size.

Hab. On trunks of trees, chiefly elm, rarely ash, in maritime and upland situations.—*Distr.* Only in S. England and the Channel Islands, but plentiful where it occurs.—*B. M.* St. Brelade's Bay and Quenvais, Jersey; Guernsey; Lydd, Kent; near Lewes, Beeding Priory, Angmering, and Glynde, Sussex; Lymington, Hants; Brading, St. Lawrence and Shanklin, Isle of Wight; Ilsham Valley, Torquay, and near Ilfracombe, Devon; near Penzance, Cornwall.

9. **G. cornea** A. L. Sm.—Thallus effuse, very thin, granuloso-pulverulent, whitish (K −, CaCl −), often evanescent. Apothecia small, adnate, somewhat concave or suburceolate, reddish or brownish flesh-coloured, the margin entire, smooth, paler; hypothecium colourless; spores 8nate, elongato-acicular, multi-(9–13-) septate, 0,058–80 mm. long, 0,003–4 mm. thick; hymenial gelatine pale-bluish with iodine.—*Lichen corneus* With. Arr. ed. 3, iv. p. 20, t. 31, f. 3 (1796) non herb.; Engl. Bot. t. 965; Leight. Angio. Lich. p. 86, t. xiv. f. 4. *Lecidea carneola* Ach. Lich. Univ. p. 194, t. 2, f. 7 (1810); Nyl. Lich. Scand. p. 191; S. F. Gray Nat. Arr. i. p. 472; Carroll in Journ. Bot. vi. p. 100 (1868); Cromb. Lich. Brit. p. 63; Leight. Lich. Fl. p. 34; ed. 3, p. 367. *L. cornea* Hook. in Sm. Engl. Fl. v. p. 183 (1833); Tayl. in Mackay Fl. Hib. ii. p. 128. *Bacidia carneola* Koerb Syst. Lich. Germ. 186 (1855); Mudd Man. p. 182. The description and fig. of Withering correspond with this plant, though the specimens in his herbarium belong to a different species *Biatorina Griffithii* Massal. (*cf.* Grevillea xii. p. 59).

Exsicc. Leight. n. 117; Johns. n. 330.

Well characterized by the form, septation and size of the spores, which readily distinguish it from all the allied species. The apothecia, somewhat scattered, are semitransparent, and become in age less concave, with the margin darker. At times the whole plant is more or less infested by *Lepraria rubens* Ach.

A plant corresponding with this in the form and septation of the spores is *L. chrysophœa* Nyl. in Act. Soc. Linn. Bord. ser. 3, t. i. p. 438 (1856); but this is doubtfully British. *Lecidea pallida* Nyl. *l. c.*, with oblongo-fusiform 3-septate spores, is more probably a fungus (*cf.* Nyl. Lich. Scand. p. 192).

Hab. On smooth bark of trees in wooded maritime and upland districts.—*Distr.* Somewhat rare in England and Wales; rare in S.W. Ireland; not seen from Scotland or the Channel Islands.—*B. M.* Near Ryde, Isle of Wight; Lyndhurst, New Forest, Hants; Lustleigh, Devon; Ashdown Forest, Tilgate, and Eridge Park, Sussex; Twycross, Leicestershire; Barmouth, Merioneth; Trefriw, Garn and Gwdir, Denbighshire; Haughmond Hill, Shropshire; Eglestone and Teesdale, Durham; Keswick, Cumberland; Dinis, Killarney, Kerry.

71. **LECIDEA** Ach. Meth. p. 32 (1803); Nyl. emend. in Mém. Soc. Cherb. t. iii. p. 181 (1856).

Thallus squamose, pulverulent, granulose, continuous, areolate, rimulose, evanescent or absent; hypothallus various, persistent or indistinct. Algal cells *Protococcus* or rarely *Trentepohlia*. Apothecia either discolorous (not black) and biatorine, or black and lecideine, the proper margin often obliterated; spores usually eight in the ascus, ellipsoid or oblong, simple, colourless; hymenial gelatine variously tinged with iodine. Spermogones with spermatia acicular, straight, rarely arcuate, or shortly cylindrical.

This extensive genus has been grouped under four sections. The spores are colourless and simple or rarely faintly 1-septate; the asci are 8- or sometimes 6-spored, excepting in the section *Megalospora* which contains one species with a 1- or 2-spored ascus. The term *biatorine*, from *Biatora*, has been applied to those apothecia that are lighter in colour and soft in texture, while *lecideine* signifies the dark almost black fruits that are carbonaceous and hard, and that belong more particularly to the *Eulecideæ*. There is, however, no clear line of demarcation, as the colour and form of the fruits change with age. The genus is very well represented in our islands, where a considerable number of species seem to be endemic. The chemical reactions, which have been given as far as possible, will be found to be useful in distinguishing plants which otherwise might readily be confounded. The species within the genera have been grouped as nearly as possible in the order followed by Nylander and subsequently by Hue and Crombie.

Thallus distinctly squamulose..... § i. PSORA (1–15).
Thallus variously crustaceous.
  Ascus 8-spored.
    Apothecia lighter in colour ..... § ii. BIATORA (16–76).
    Apothecia dark and carbonaceous § iii. EULECIDEA (77–200).
  Ascus 1- or 2-spored.
    Apothecia dark ..... § iv. MYCOBLASTUS (201–2).

§ i. Psora Haller Hist. Stirp. Helv. iii. p. 93 (1768) et auctt., pro parte. (Pl. 5.)

Thallus squamulose; spores 8nate. Spermogones with simple sterigmata and straight spermatia.

1. **L. lurida** Ach. Meth. p. 77 (1803) & Syn. p. 51 (1814).—Thallus imbricato-squamose, appressed, cæspitose, lurid or lurid-brown, opaque (K—, CaCl—); squamules orbicular, rigid, smooth, sinuate-lobed. Apothecia moderate, adnate, plane, brownish-black, pale within, the margin obtuse, slightly flexuose, at length convex and immarginate; hypothecium thick, dark-brown; paraphyses stout, coherent, reddish-brown at the apices; spores ellipsoid or oblong-ellipsoid, 0,013–15 mm. long, 0,005–7 mm. thick; hymenial gelatine slightly bluish then wine-red with iodine.—Hook. Fl. Scot. ii. p. 40; Carroll in Nat. Hist. Rev. vi. p. 525; Cromb. Lich. Brit. p. 64; Leight. Lich. Fl. p. 252; ed. 3, p. 244. *Lichen luridus* Sw. in Nov. Act. Upsal. iv. p. 247 (1784); Dicks. Crypt. fasc. ii. p. 20; With. Arr. ed. 3, iv. p. 28; Engl. Bot. t. 1329. *Lepidoma luridum* S. F. Gray Nat. Arr. i. p. 460 (1821). *Psora lurida* DC. Fl. Fr. ii. p. 370 (1805); Mudd Man. p. 170. *Lichenoides pulmonarius saxatilis viridis*, etc., Dill. Hist. Musc. p. 228, t. 30. f. 134 (1740).

Exsicc. Dicks. Hort. Sicc. n. 25; Cromb. n. 79; Larb. Cæsar. n. 31, Lich. Hb. n. 340.

When sterile and only spermogoniiferous might readily be taken for an *Endocarpon* allied to *E. hepaticum* Ach. In more shady situations the thallus is occasionally pale-brown, with the squamules more concrete, when it is form *pallescens* Th. Fr. Lich. Scand. p. 414 (1874), a condition which rarely occurs in this country. The apothecia are generally rather scattered and in age become black.

Hab. On calcareous soil among rocks in maritime and upland districts.—*Distr.* Here and there in Great Britain and the Channel Islands, though plentiful where it occurs; not seen from Ireland.—*B. M.* St. Ouen's Bay and Portelet Bay, Jersey; Saints' Bay, Guernsey; above Anstey's Cove, Torquay, Devon; Yatton, Herefordshire; Cheddar Cliffs and Bathford Hill, Somerset; Cunning Dale, near Buxton, and above Cromford, Derbyshire; Dolgelly, Merioneth; Great Orme's Head, Carnarvonshire; Teesdale and Eglestone, Durham; Cumberland; King's Park, Edinburgh; Island of Lismore, Argyll; Ben Lawers, Perthshire; Clova Mts., Forfar; Craig Guie, Braemar, Aberdeenshire.

2. **L. globifera** Ach. Lich. Univ. p. 213 (1810).—Thallus squamoso-imbricate, somewhat shining, areolate, reddish-brown or chestnut-red, paler beneath (K—, CaCl—); squamules reniform, rigid, roundly lobed, flexuose, subhorizontal. Apothecia small, prominent, convex, at length globose, immarginate, often conglomerate, brown or brownish-black, pale within; paraphyses coherent, reddish-brown at the apices; hypothecium thin, brownish; spores subellipsoid, 0,012–15 mm. long, 0,005–6 mm. thick; hymenial gelatine slightly bluish then wine-red with

iodine.—Cromb. Lich. Brit. p. 64; Leight. Lich. Fl. p. 250; ed. 3, p. 241. *Psora globifera* Massal. Lich. Ric. p. 91 (1852); Mudd *l. c.*

Differs from the preceding in the smaller, more ascending, shining rugulose thallus, and the more elevated, globose, often aggregate apothecia.—According to Th. Fries (Lich. Scand. pp. 411, 412) the squamules are rarely more or less white-suffused and the apothecia usually violaceo-pruinose, neither of which characters are apparent in the few, chiefly fragmentary, British specimens.

Hab. On the ground in crevices of rocks in hilly and mountainous regions.—*Distr.* Found only very sparingly in W. England, N. Wales, S. Scotland, and on the S. Grampians.—*B. M.* Greeba Mt., Isle of Man; Dolgelly, Merioneth; Arthur's Seat, Edinburgh; Ben Lawers, Perthshire.

3. **L. rubiformis** Wahlenb. Fl. Lapp. p. 479 (1812).—Thallus squamulose, imbricate, pale-sordid-brownish, white beneath (K−, CaCl−); squamules ascending, small, firm, subreniform, usually white and crenate at the margins. Apothecia small, adnate, convex, immarginate, often aggregate, blackish or slightly æruginose-suffused; hypothecium pale-brownish; paraphyses concrete, reddish at the apices; spores 8nate, ellipsoid or oblong, 0,012–17 mm. long, 0,005–7 mm. thick; hymenial gelatine bluish then sordid with iodine.—Carroll in Journ. Bot. iii. p. 289 (1865); Cromb. in Grevillea xxii. p. 9. *L. globifera* var. *rubiformis* Cromb. Lich. Brit. p. 64 (1870); Leight. Lich. Fl. p. 250; ed. 3, p. 241. *Bæomyces rubiformis* Wahlenb. in Ach. Meth. p. 324, t. 7. f. 5 (1803). *Lichen rubiformis* Sm. Engl. Bot. t. 2112 (1810). *Lepidoma rubiformis* S. F. Gray Nat. Arr. i. p. 461 (1821). *Psora rubiformis* Hook. in Sm. Engl. Fl. v. p. 193 (1833); the description "apothecia hollow, red" applies apparently to a different species referable to *Cladonia* (*cf.* Mudd Man. p. 62). The specimen figured in Engl. Bot. is not among Sowerby's plants; and I am unable to find it in Smith's herbarium at the Linnean Society.

Intimately related to *L. globifera*, of which it is probably only a variety, differing chiefly in the colour of the thallus and the slightly larger spores. It is often cæspitose with the squamules nearly erect (*fide* Th. Fries Lich. Scand. p. 413 (1874)), which is not so distinctly marked in our two small specimens. The constantly convex apothecia are at length conglomerate, presenting, as Wahlenberg says, the appearance of the fruit of *Rubus cæsius*.

Hab. On the ground in crevices of rocks in an alpine situation.—*B. M.* Ben Lawers, Perthshire.

4. **L. rhizobola** Nyl. in Flora xlviii. p. 4 (1865).—Thallus squamulose, appressed, chestnut-brown or lurid-brownish (K−, CaCl−); squamules rigid, rounded or rotundato-difform, crenate at the margins, pale or whitish beneath, unequal, with long central radicles. Apothecia moderate, convex, blackish, pale within; paraphyses not well discrete; spores oblong-ellipsoid,

0,012–16 mm. long, 0,006–7 mm. thick; hymenial gelatine wine-red with iodine.—Carroll in Journ. Bot. iii. p. 289 (1865); Cromb. Lich. Brit. p. 64; Leight. Lich. Fl. p. 251; ed. 3, p. 242.

Easily distinguished from its immediate allies by the squamules being on the under surface pale and radiculose, with the radicles long and divided. This character also separates it from the other species of this subsection. The single British specimen seen is but sparingly fertile.

Hab. On the ground among rocks in an alpine situation.—*B. M.* Near the summit of Ben Lawers, Perthshire.

5. **L. testacea** Ach. Meth. p. 80 (1803) & Syn. p. 51 (1814).—Thallus appressed, squamulose, greenish- or livid-grey, or greyish-yellow (K−, CaCl−); squamules rigid, subimbricate, undulato-crenate, white beneath and at the margins. Apothecia moderate, sessile, convex, orange-red or testaceous, whitish within; paraphyses subdiscrete, orange or tawny at the apices; hypothecium colourless; spores 8nate, ellipsoid, 0,010–13 mm. long, 0,005–7 mm. thick; hymenial gelatine bluish then sordid-violet with iodine.—Cromb. in Grevillea xxii. p. 9 (1893). *Psora testacea* Hoffm. Pl. Lich. i. p. 99, ff. 5, 6 (1790). *Lichen saxifragus* Sm. in Trans. Linn. Soc. i. p. 82, t. 4. f. 4 (1791). *Lepidoma testaceum* S. F. Gray Nat. Arr. i. p. 461 (1821).

Resembles a *Lecanora* of the subgenus *Squamaria*, near *L. crassa*, but is a true *Lecidea*. The apothecia in a very young state are plane with paler margin, but when more advanced become convex and immarginate. The spermogones, not visible in our specimen, are pale, with the sterigmata simple, rarely 2–3-jointed, and spermatia cylindrical, straight, 0,007 mm. long, 0,001 mm. thick (*fide* Nyl. in Act. Soc. Linn. Bord. ser. 3, i. p. 350 (1856)).

Hab. On calcareous rocks in an upland hilly district.—*B. M.* Cleve Hill, Somerset (the only locality).

6. **L. glaucolepidea** Nyl. in Mém. Soc. Cherb. v. p. 337 (1857) (nomen); Carroll in Nat. Hist. Rev. vi. p. 526, t. 32. ff. 2, 3 (1859).—Thallus effuse, membranaceous, squamulose, glaucous-green (Kf+, CaCl−); squamules small, somewhat scattered or contiguous, ascending, rounded, inciso-lobed, crenate, and often greyish-sorediate at the margins. Apothecia adnate, moderate or somewhat large, convex, immarginate, reddish-brown or blackish; hypothecium thick, pale-brown; paraphyses conglutinate; spores 8nate, ovoid or oblong, 0,012–16 mm. long, 0,005–7 mm. thick; hymenial gelatine bluish then sordid with iodine.—Cromb. Lich. Brit. p. 63; Leight. Lich. Fl. p. 251; ed. 3, p. 243. *Psora glaucolepidea* Mudd Man. p. 171, t. 3. f. 62 (1861).

When sterile might readily be taken for the basal thallus of a *Cladonia* near *C. delicata*. In this condition as regards colour and mode of growth it resembles *Normandina*, but differs in the form of the squamules and their sorediiferous margins. The apothecia,

sparingly present, are in their young state plane and margined, the margin speedily becoming obsolete.

Hab. On peaty ground in mountainous regions.—*Distr.* Only a few localities in N.W. England, the S. and Central Grampians, Scotland, S.W. and N.E. Ireland.—*B. M.* Mardale, Westmoreland; Glen Falloch and Rannoch, Perthshire; near Ballintoy, Antrim.

7. **L. Friesii** Ach. in Liljebl. Sv. Fl. p. 610 (1816).—Thallus effuse, squamulose, granulose, cervine or cervine-yellow (K−, CaCl−), the squamules small, rotundate, inflexed, convex-gibbose, at times plicate, smooth and shining. Apothecia small, sessile, black, naked, plicate-crispate, the margin thin, persistent; paraphyses concrete, hypothecium dark-brown; spores ellipsoid, 0,007–8 mm. long, 0,003–4 mm. thick; hymenial gelatine pale-bluish with iodine.—Leight. in Ann. Mag. Nat. Hist. xiv. p. 404, t. ix. f. 8, 9, 11 (1864) & Lich. Fl. p. 253; ed. 3, p. 245; Cromb. Lich. Brit. p. 92. *Psora caradocensis* Mudd Man. p. 169 pro parte, t. 3. f. 61 (1861).

Exsicc. Mudd n. 142.

Somewhat similar to and at first sight apt to be taken for *Bilimbia caradocensis*, but distinguished by its thallus and spores. The British plants seen are only sparingly fertile; the spermogones, rarely present, are verrucæform, black, scattered or conglomerate, with spermatia oblong or subcylindrical, straight, about 0,003 mm. long.

Hab. On decorticated trunks of oak and old palings, in an upland district.—*Distr.* Very local in N. England, but probably to be detected elsewhere.—*B. M.* Boysdale, Cleveland and Farndale, Yorkshire.

8. **L. ostreata** Schær. Spicil. p. 110 (1828).—Thallus effuse, squamulose, glaucous or pale-olive (K−, CaCl + dark-crimson), the squamules imbricate, reniform, crowded or scattered, ascending or suberect smooth, crenate, the under side and margins usually white-pulverulent. Apothecia moderate, scattered, basal on the squamules, black, slightly glaucous-pruinose, the margin thin, at length flexuose; hypothecium thick, brownish-black; paraphyses concrete, colourless, yellowish in the mass; spores 8nate, ellipsoid or fusiform, simple, small, 0,010–12 mm. long, 0,0025–35 mm. thick; hymenial gelatine bluish with iodine.—Cromb. Lich. Brit. p. 91; Leight. Lich. Fl. p. 253; ed. 3, p. 245. *Psora ostreata* Hoffm. Deutschl. Flora (1795 ii. p. 163); Mudd Man. p. 169. *P. scalaris* Hook. in Sm. Engl. Fl. v. p. 192 (1833). *Lichen scalaris* Sm. Engl. Bot. t. 1501 (1805). *Lepidoma scalare* S. F. Gray Nat. Arr. i. p. 461 (1821).

Exsicc. Leight. n. 50; Mudd n. 141; Cromb. n. 188.

When sterile might readily be taken for var. *ostreata* of *Cladonia macilenta* (as noticed in Part I. p. 171), but is at once distinguished from this by the different chemical reaction of the thallus. It spreads extensively over the substratum, the squamules being either plane or slightly convex. The apothecia in this country are apparently extremely rare and occur on only a few of our specimens.

Hab. On old palings, occasionally on trunks of trees, very rarely erratic on sandstone, in lowland and upland situations.—*Distr.* Somewhat rare in England, but plentiful where it occurs.—*B. M.* Henham, Suffolk; Hoe Street, Walthamstow, Essex; Hampstead and near Hendon, Middlesex; Keston, Kent; near Reigate, Surrey; Ardingly (saxicolous), Sussex; New Forest, Hants; Totteridge and near Elstree, Herts; Brentwood, Essex; Twycross, Leicestershire; Hay Park, Herefordshire; near Worcester and Little Malvern, Worcestershire; Harboro' Magna, Warwickshire; Haughmond Hill, the Wrekin and Church Stretton, Shropshire; Westerdale and Stagdale, Cleveland, Yorkshire.

Var. β **myrmecina** Nyl. Lich. Scand. p. 243 (1861).—Thallus with the squamules tawny- or chestnut-brown. Apothecia naked. —*Lecidea scalaris* var. β *myrmecina* Ach. Meth. p. 78 (1803).

Differs merely in the colour of the thallus and in the constantly naked apothecia. In the single British specimen, which is only very sparingly fertile, the squamules are nearly erect.

Hab. On a decorticated stump of an old oak in a wooded upland situation.—*B. M.* Bramble Hill, New Forest, Hants.

9. **L. acutula** Nyl. in Flora lxix. p. 100 (1886).—Thallus effuse, thin, granuloso-squamulose, greyish-green or greyish-brown (K−), the squamules minute, subimbricate, somewhat convex and difform. Apothecia small, thin, black, margined, often angulose and subplicate, the margin thin, somewhat acute; paraphyses subdiscrete; epithecium and hypothecium olive-brownish-black; perithecium dark (K + obsoletely purplish); spores fusiform, 0,012–15 mm. long, 0,0025–35 mm. thick; hymenial gelatine not tinged but the asci wine-reddish with iodine.

Hab. On bark of pine in an upland situation. Found only at Staveley, near Kendal, Westmoreland; not seen.

10. **L. decipiens** Ach. Meth. p. 80 (1803).—Thallus indeterminate, squamulose, appressed, reddish or pale-flesh-coloured, white beneath; the squamules more or less discrete, subflexuose or subcrenate, and often whitish at the margins (K−, CaCl−). Apothecia marginal, adnate, plane or convex, blackish, the margin thin, entire, at length evanescent; hypothecium pale-brown; paraphyses concrete, brown towards the apices; spores ovoid or ellipsoid, 0,012–16 mm. long, 0,005–6 mm. thick; hymenial gelatine bluish with iodine.—Cromb. Lich. Brit. p. 76; Leight. Lich. Fl. p. 249; ed. 3, p. 240. *Lichen decipiens* Ehrh. in Hedw. Stirp. Crypt. ii. p. 7 (1789); Dicks. Crypt. fasc. ii. p. 21; With. Arr. ed. 3, v. p. 26; Engl. Bot. t. 870. *Lepidoma decipiens* S. F. Gray Nat. Arr. i. p. 462 (1821). *Psora decipiens* Hook. in Sm. Engl. Fl. v. p. 193 (1833); Mudd Man. p. 171.

Exsicc. Leight. n. 334.

Easily recognized by the peculiar colour of the thallus. The squamules are at first discrete and concave, when the plant has much the aspect of a Peziza, but become plane and at length

subimbricate. Their margins are at times persistently whitish (form *albomarginata* Müll. Arg. in Flora lxiv. p. 88 (1881), Cromb. in Grevillea xxii. p. 59). In age the thallus becomes more or less dealbate and subpruinose (form *cretacea* Müll. Arg. in Bull. Soc. Murith. fasc. x. p. 55, 1881). The spermogones not unfrequently have bacillar spermatia, 0,05–6 mm. long, 0,0008 mm. thick (*fide* Nyl. Lich. Env. Par. p. 77). Our British specimens are for the most part well fertile.

Hab. On cretaceous and calcareous soil in hilly and mountainous districts.—*Distr.* Only a few localities in England, N. Wales, and the Highlands of Scotland; not seen from Ireland.—*B. M.* Epsom Downs, Surrey; Newhaven, Sussex; Gogmagog Hills, Cambridge; Great Orme's Head, Carnarvonshire; Teesdale, Durham; Island of Lismore, Argyll; Craig Calliach and Ben Lawers, Perthshire; Clova Mts., Forfar.

11. **L. lugubris** Sommerf. Suppl. Fl. Lapp. p. 143 (1826) pro parte; Nyl. in Bot. Not. p. 176, fig. 6b (1852).—Thallus indeterminate, thickish, minutely squamulose, granulose-concrete, broken up into crumb-like portions, brownish- or chocolate-grey (K−, CaCl−); hypothallus black, apothecia small or submoderate, superficial, plane, margined, opaque, black, within greyish-white, the margin thickish, prominent, entire, persistent, occasionally subflexuose; paraphyses slender, very loosely coherent, thickened at the apices; epithecium dark-green; hypothecium blackish-brown; spores spherical, halonate, 0,008–9 mm. in diam.; hymenial gelatine bluish with iodine. — Lindsay in Quart. Journ. Microsc. Sci. v. p. 177, t. 11 (1857); Cromb. Lich. Brit. p. 85; Leight. Lich. Fl. p. 255; ed. 3, p. 246. *Schæreria lugubris* Koerb. Syst. Lich. Germ. p. 232 (1855); Mudd Man. p. 213, t. iv. fig. 78 (1861).

Exsicc. Cromb. n. 91; Mudd n. 183.

Nylander has discussed and determined the nomenclature of this plant (Lich. Scand. pp. 233, 293 (1861)), Sommerfelt's original specimen having included two distinct species, *L. caudata* Nyl. and *L. lugubris*. It is well characterized by the spores which are uniseriate in the narrow, elongate-cylindrical asci. The thallus, which usually spreads extensively, is composed of very minute or subminute, crowded, sublobulate, more or less convex squamules, eventually obliterating the hypothallus. The squamules are rather larger planer and more discrete when the plant is muscicolous. The numerous hypothecia are generally somewhat scattered. The spermogones, not often visible, are punctiform, black, with short, cylindrical, straight spermatia.

Hab. On rocks and boulders, granitic and schistose, very rarely incrusting mosses, in mountainous districts.—*Distr.* Found only in N. Wales, N. England and among the Grampians, Scotland; not seen from Ireland.—*B. M.* Cader Idris, Merioneth; Ayton, Kildale Moor, Cleveland, and Cronkley Scar, Yorkshire; High Force, Teesdale, Durham; Ben Lawers, Craig Tulloch and Glen Fender, Blair-Athole, Perthshire; Morrone, Braemar, Aberdeenshire.

Var. **lugubrior** A. L. Sm.—Thallus more or less minutely granular, effuse, not squamulose, greyish- or dark-brownish on a

black hypothallus. Apothecia scattered, black, small with a thick, tumid margin; spores uniseriate in the ascus, with a very thick border, almost cuboid at first from compression, larger than in the type, about 0,012 mm. in diameter.

The three specimens collected by Crombie are all from one locality. One of them Nylander had recognized as distinct from, though closely allied to, *L. lugubris*, and had given it a specific name which we have adopted for the variety.

Hab. On the schistose stones of an old wall.—*B. M.* Glen Fender, Blair Athole, Perthshire.

12. **L. confertula** Stirton in Trans. Glasgow Soc. Nat. p. 86 (1875).—Thallus pallid-cinereous, crustaceous, squamulose, the squamules small, contiguous or dispersed (K−, CaCl−). Apothecia dark-brown, minute, numerous, nearly plane with an obtuse margin, often contiguous; hypothecium colourless; paraphyses almost coherent, clavate and brown at the apices, spores ellipsoid, 0,010–13 mm. long; hymenial gelatine blue then reddish-violet with iodine especially the asci.—Leight. Lich. Fl. ed. 3, p. 243. Specimen not seen.

Hab. On rocks. Collected by Dr. Stirton near Killiecrankie, Perthshire.

13. **L. endocyanea** Stirton in Scott. Nat. iv. p. 165 (1877).—Thallus blackish, squamulose-diffract, the squamules plane or somewhat convex, appressed (K−, CaCl−). Apothecia brownish-black, sessile, small, at first urceolate, then plane or convex and immarginate, internally nearly all, but especially upwards of a violet colour; hypothecium brownish or nearly colourless; paraphyses distinct, slender, closely intertwined at the apices; spores ellipsoid or oblong-ellipsoid, 0,011–14 mm. long, 0,006–7 mm. thick; hymenial gelatine blue then yellowish with iodine.—Leight. *l. c.* Specimen not seen.

Hab. On rocks. Collected by Dr. Stirton in Island of Mull.

14. **L. sporeta** Stirton *l. c.* p. 166.—Thallus whitish squamulose, the squamules dispersed, plane or somewhat convex and sometimes crenulate (K−, CaCl−). Apothecia small, brownish-black, crowded, adnate, plane, obtusely margined, somewhat shining, hypothecium colourless; paraphyses not well discrete, brown at the apices; spores ellipsoid, 0,011–15 mm. long, 0,005–6 mm. thick; hymenial gelatine blue then brownish with iodine.—Leight. *l. c.* p. 244. Specimen not seen.

Hab. On rocks. Collected by Dr. Stirton in Island of Mull.

15. **L. pissodes** Stirton *l. c.*—Thallus dark brownish-black, squamulose, diffract, the squamules small, somewhat concave or plane (K−, CaCl−). Apothecia black, small, crowded, innate, plane, slightly margined; hypothecium colourless; paraphyses

indistinct, irregular, slender, dark bluish-black at the apices; spores oblong, 0,007–10 mm. long, 0,0035–45 mm. thick; hymenial gelatine blue then brownish with iodine.—Leight. *l. c.* Specimen not seen.

Hab. On rocks. Collected by Dr. Stirton in Island of Mull.

§ ii. Biatora Fr. in Vet. Ak. Handl. 1882 p. 63; Nyl. in Mém. Soc. Cherb. ii. p. 182 (Pl. 6).

Thallus very variable, at times almost obsolete. Apothecia biatorine, plane or convex, brightly coloured, partly or very rarely entirely black; asci usually 8-spored; spores simple, colourless. Spermogones with simple rarely jointed sterigmata and straight very rarely arcuate spermatia.

16. **L. cinnabarina** Sommerf. in Vet. Ak. Handl. p. 115 (1823).—Thallus effuse, thin, smooth or leprose-granulose, whitish (K+yellowish, CaCl−). Apothecia adnate or appressed, somewhat plane and obtusely margined, then convex and immarginate, cinnabarine-reddish; paraphyses coherent; epithecium reddish (K+rose-coloured); hypothecium colourless; spores oblong or fusiform, small, 0,008–12 mm. long, 0,002–3 mm. thick; hymenial gelatine, especially the asci, bluish with iodine.—Cromb. in Grevillea xxii. p. 9.

A very distinct species, readily distinguished by the colour of the apothecia. The thallus, which elsewhere spreads extensively, is sprinkled with whitish, pulvinate soredia. It is one of our rarest lichens, only two fertile British specimens having been gathered, though the sterile thallus may not be uncommon in the district cited.

Hab. On the smooth bark of old stunted birches in a wooded mountainous region.—*B. M.* Mar Forest, Braemar, Aberdeenshire (the only locality).

17. **L. lucida** Ach. Meth. p. 74 (1803).—Thallus effuse, thin, leprose, rarely granulose, yellow, citrine-yellow or yellowish-green (K−, CaCl−). Apothecia minute, scattered, plane or convex, very thinly margined or immarginate, pale lemon-yellow; spores oblong-ovoid or narrowly obovate, simple, colourless, minute, 0,004–6 mm. long, 0,0018–25 mm. thick; hypothecium colourless; paraphyses stoutish, coherent; epithecium granulose; hymenial gelatine bluish then wine-red with iodine.—S. F. Gray Nat. Arr. i. p. 475; Hook. Fl. Scot. ii. p. 40 & in Sm. Engl. Fl. v. p. 185; Mudd Man. p. 193; Cromb. Lich. Brit. p. 65; Leight. Lich. Fl. p. 258; ed. 3, p. 254. *Lichen lucidus* Ach. Prodr. p. 39 (1798); Engl. Bot. t. 1550.

Exsicc. Leight. n. 385; Larb. Cæsar. n. 36, Lich. Hb. n. 306.

Easily recognized among the allied species by the colour of the thallus and of the apothecia. When sterile, as is very frequently the case in this country, the thallus has a superficial resemblance to that of *Coniocybe furfuracea*, for which it might be mistaken. The algal

cells are described by Th. Fries (Lich. Scand. p. 432), as either globose eugonidia or ellipsoid or oblong leptogonidia. When lignicolous it is var. β *theiotea* Ach. in Vet. Ak. Handl. 1808, p. 270, Cromb. in Grevillea i. p. 172, Leight. Lich. Fl. ed. 3, p. 235; and when terricolous and herbicolous it is var. γ *satura* Ach. (*fide* Th. Fries, *l. c.*). These, however, are mere states, both of which seem to be very rare in Great Britain. The apothecia are usually somewhat scattered.

Hab. On shady rocks and walls, seldom on decaying trunks of trees and grasses on the ground, in lowland and upland situations.—*Distr.* General and not uncommon in England, rare in Scotland and the Channel Islands; not seen fertile in Ireland (*fide* Carroll).—*B. M.* Rozel, Jersey; Guernsey; Ightham, Kent; Dawlish and near Chagford, Devon; Trellick, Monmouthshire; Knightsford Bridge, Worcestershire; Llanderfel, near Bala, Cader Idris and Barmouth, Merioneth; Oswestry, Shropshire; Ayton Moor, Cleveland, Yorkshire; near Stavely, Kendal, Westmoreland; New Galloway, Kirkcudbright; Glen Creran, Argyll; Craigforth, near Stirling; Falls of Tummel and Glen Fender, Blair Athole, Perthshire; Killarney, Kerry.

18. **L. clavulifera** Nyl. in Flora lii. p. 294 (1869) & lxiv. p. 539 (1881).—Thallus effuse, thin, granulate or subleprose, the granules often somewhat scattered, white, greyish-green or yellowish-green (K−, CaCl−). Apothecia minute, convex, immarginate, sordid-ochraceous or testaceous-red, blackish or black; paraphyses coherent; epithecium and hypothecium pale; spores oblong or clavate, very minute, 0,004–6 mm. long, 0,001 mm. thick; hymenial gelatine bluish then tawny-wine-red with iodine.—Cromb. in Grevillea vi. p. 115; Leight. Lich. Fl. ed. 3, p. 255.

A variable plant as to the colour of the thallus and apothecia; it is, however, well characterized by the minute, clavate spores. The gonidia are small and minutely clustered. In our saxicolous specimens (in Lapland, where it was originally gathered, it is corticolous) the thallus is very thin and more or less scattered. The apothecia are numerous and constantly convex.

Hab. On shady rocks and stones of walls in an upland situation.—*B. M.* Near Clifden, Connemara, Galway (the only locality).

Form **subviridicans** Nyl. in Flora lx. p. 463 (1877).—Thallus greenish. Apothecia and spores as in the type.—Cromb. in Grevillea vi. p. 115; Leight. Lich. Fl. ed. 3, p. 255 (errore *subviridans*).

Exsicc. Larb. Lich. Hb. n. 29.

Apparently only a state, owing its greener colour to the place of growth. The single specimen seen is but sparingly fertile.

Hab. On rocks in cave in a mountainous district.—*B. M.* Doughruagh Mt., Connemara, Galway (the only locality).

19. **L. quernea** Ach. Meth. p. 62 (1803).—Thallus determinate or effuse, thinnish or submoderate, minutely granulate-pulverulent, yellowish or yellowish-green or pale brownish-yellow (K+yellow,

K(CaCl)+orange-red). Apothecia submoderate, scattered, sub-immersed, slightly convex, immarginate, reddish-brown or dark-red, concolorous within; paraphyses coherent; hypothecium pale; spores ellipsoid, 0,008–12 mm. long, 0,005–7 mm. thick; hymenial gelatine bluish then sordidly tawny-wine-coloured with iodine.—S. F. Gray Nat. Arr. i. p. 459; Hook. in Sm. Engl. Fl. v. p. 180; Tayl. in Mackay Fl. Hib. ii. p. 126; Cromb. Lich. Brit. p. 65; Leight. Lich. Fl. p. 264; ed. 3, p. 262. *Lichen querneus* Dicks. Crypt. fasc. i. p. 9, t. 2. f. 3 (1785); Engl. Bot. t. 485; With. Arr. ed. 3, iv. p. 11. *Pyrrhospora quernea* Koerb. Syst. Lich. Germ. p. 209 (1855); Mudd Man. p. 192, t. 3. f. 75 (1861).

Exsicc. Leight. n. 61; Larb. Cæsar. n. 37; Bohl. n. 84.

A well-marked species, which at first sight might be taken for a biatorine condition of some plant allied to *Lecanora varia*. It has been referred to the genus *Pyrrhospora* on account of the spores being at times reddish-brown; this colour (as in other instances) is visible only in dead ones which have remained long in the asci (*vide* Th. Fries Lich. Scand. p. 426). The thallus, often sterile, usually spreads extensively over the substratum, but at times is limited by a black hypothalline line. The apothecia are more or less scattered, becoming somewhat difform in age.

Hab. On the trunks of old trees, chiefly oaks, in wooded upland districts.—*Distr.* Not uncommon in most parts of England, rare in N. Wales, Ireland, and the Channel Islands; not seen from Scotland. —*B. M.* Rozel, Island of Jersey; Ickworth, Suffolk; Epping Forest and Hadleigh Woods, Essex; Shiere, Surrey; Wrotham, Kent; Clayton, Withyham, Henfield, Wakehurst Park, Tilgate and St. Leonard's Forest, Sussex; New Forest, Hants; Lustleigh and near Kingskerswell, Devon; Downton, Wilts; Oakley Park, near Cirencester, Gloucestershire; near the Lodge, Herefordshire; Crowle Road, near Worcester and Ledbury, Worcestershire; Garn Dingle, Denbighshire; Aston, Warwickshire; Royston Hill, The Wrekin, Gobowen, and Buildwas, Shropshire; Easby Wood, Cleveland, Yorkshire; near Bishop Auckland, Durham; near Belfast, Antrim; Castle Bernard Park, Cork.

20. **L. phæops** Nyl. in Not. Sallsk. Faun. & Fl. Fenn. iv. p. 5 (1858).—Thallus determinate, thin, smooth, continuous, rimulose, white or greyish-white (K+yellowish, CaCl−); hypothallus whitish. Apothecia small, innate, angulose, plane, immarginate, brown or reddish-brown, concolorous within; paraphyses slender, crowded; hypothecium reddish beneath; spores fusiformi-ellipsoid, 0,009–15 mm. long, 0,005–6 mm. thick; hymenial gelatine deep blue with iodine.—Salw. in Trans. Bot. Soc. Edin. vii. p. 554; Cromb. Lich. Brit. p. 65; Leight. Lich. Fl. p. 296. *Lecanora phæops* Th. Fr. Lich. Scand. p. 287 (1874); Leight. Lich. Fl. ed. 3, p. 181.

Exsicc. Larb. Lich. Hb. n. 17.

Somewhat resembles biatorine species of the section *Aspicilia* of the genus *Lecanora*. From its general habit and the structure of the fructification, it may perhaps with greater propriety be arranged

among the Biatoras. The apothecia, numerous but discrete, are in a very young state thinly margined and vary in size from subminute to submoderate, in which latter case it is forma *major* Cromb. in Leight. *l. c.*

Hab. On rocks, chiefly schistose, usually near water, in mountainous regions.—*Distr.* Only in Wales, on the Grampians, Scotland, and in W. Ireland.—*B. M.* Cader Idris, Merioneth; Plinlimmon, Cardiganshire; Nant Francon, Llyn Clwyd and Snowdon, Carnarvonshire; Ben Cruachan, Argyll; Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire; Mangerton, Kerry; Delphi and Doughruagh Mts., Connemara, Galway.

21. **L. lithophiliza** Nyl. in Flora li. p. 473 (1868).—Thallus subdeterminate, thinnish, firm, unequally flattened, areolate-diffract or areolate-rimose, greyish or greyish-white (Kf+ yellowish, CaCl−). Apothecia submoderate, innate, somewhat plane or convex, immarginate, brownish or brownish-black, white within, bounded beneath by a thin black line; paraphyses moderate, lurid-brownish at the apices; hypothecium with the middle layer chalky-white, opaque (not hyaline), the lower conceptacular layer thin, black; spores oblong, 0,009–17 mm. long, 0,0035–45 mm. thick; hymenial gelatine bluish with iodine.—Cromb. in Journ. Bot. vii. p. 106 (1869) & Lich. Brit. p. 66; Leight. Lich. Fl. p. 286; ed. 3, p. 292.

Might at first sight be taken for a variety of *L. lithophila*, but differs in the deeply-cracked thallus, and its chemical reaction, as also in the immarginate, innate apothecia, with their longer spores. Nylander however rightly regards it as a *Biatora* near the preceding species. The apothecia are numerous and at times subconfluent.

Hab. On schistose rocks and walls in maritime and mountainous districts.—*Distr.* Only sparingly in N. Wales, N. England, and among the Grampians, Scotland.—*B. M.* Near Hexham, Northumberland; Garth, Dolgelly, Merioneth; Crianlarich, Ben Lawers, and Craig Tulloch, Perthshire; Portlethen, Kincardineshire.

22. **L. Gagei** A. L. Sm.—Thallus effuse, thickish, smooth, rimulose-diffract, cream-coloured or brownish-white (K+yellow, CaCl−). Apothecia moderate, at first immersed, plane, with thin entire margin, at length superficial, somewhat convex and immarginate, brownish-red, pale within; paraphyses slender, not well discrete, brownish at the apices; spores ellipsoid, 0,018–22 mm. long, 0,008–10 mm. thick; hymenial gelatine bluish then tawny-wine-red with iodine.—*L. Taylori* Mudd Man. p. 199 (1861). Leight. Lich. Fl. p. 291; ed. 3, p. 296. *L. lævigata* Nyl. in Cromb. Lich. Brit. p. 65 (1870). *Lichen Gagei* Sm. Engl. Bot. t. 2580 (1814), young state. *Verrucaria Gagei* Borr. ex Hook. in Sm. Engl. Flora v. p. 153 (1833). *Bæomyces anomalus* Tayl. in Mackay Fl. Hib. ii. p. 79 (1836). *Biatora Taylori* Salw. in Trans. Penzance Nat. Hist. Soc. 1853, p. 144.

Exsicc. Leight. n. 283.

A distinct species with much of the general aspect of *L. phœops*, but with different apothecia. It also somewhat resembles states of *L. coarctata*, but the different thalline reactions with CaCl and the firmer immarginate apothecia keep it distinct. These latter, numerous though scattered, are at length somewhat difform, and in more shady situations they remain immersed.

Hab. On rocks, granitic and schistose, in maritime and mountainous districts.—*Distr.* Only a few localities in W. England and W. Ireland, but plentiful where it occurs.—*B. M.* Bolt Head and near Torquay, Devon; near Penzance, Cornwall; Cader Idris and Barmouth, Merioneth; Craigforda, Shropshire; Glena, Killarney, Dunkerron and Blackwater Bridge, Kerry; Lough Inagh and Doughruagh Mt., Connemara, Galway.

23. **L. coarctata** Nyl. in Act. Soc. Linn. Bord. ser. 3, i. p. 358 (1856).—Thallus effuse, thinnish, rimulose, subareolate or continuous, whitish or greyish (Kf+yellowish, CaCl+deep-red). Apothecia small, innate-sessile, plane or convex, brown, reddish-brown or blackish, with a spurious white epithalline margin which is sometimes connivent and almost closed over the apothecium; hypothecium almost colourless; paraphyses slender, dark at the apices; spores ellipsoid, large, 0,014–24 mm. long, 0,007–12 mm. thick; hymenial gelatine pale-bluish then wine-red with iodine.—Cromb. in Grevillea xxii. p. 9 & Lich. Brit. p. 66; Leight. Lich. Fl. p. 278; ed. 3, p. 280. *Lichen coarctatus* Sm. Engl. Bot. t. 534 (1799). *Rinodina coarctata* S. F. Gray Nat. Arr. i. p. 449 (1821). *Lecanora coarctata* Hook. in Sm. Engl. Fl. v. p. 187 (1833); Tayl. in Mackay Fl. Hib. ii. p. 134; Mudd Man. p. 154.

Exsicc. Leight. n. 177; Johns. n. 332.

Viewed by many authors as a *Lecanora* from the spurious thalloid margin of the apothecia, which, however, contains no algal cells. Nylander has also referred it to that genus (Enum. Lich. Fret. Behr. p. 12), where its place would be in the *Aspicilia* section. It is a very protean species both as to the thallus and the apothecia, the differences in which give rise to the varieties and forms that follow. In the typical specimen figured in Engl. Bot. the thallus is thin, rimoso-areolate, rugulose, in which state it seems to be *Lecanora ocrinæta*, Ach. Lich. Univ. p. 380 & Syn. p. 102. The apothecia are numerous, usually more or less scattered, becoming in age convex, blackish, with the spurious margin obliterated.

Hab. On walls and rocks, chiefly brick and sandstone, in maritime and upland districts.—*Distr.* Only here and there in England and Wales; not seen from Scotland or Ireland.—*B. M.* Yarmouth, Norfolk; Hendon, Middlesex; Reigate and Leith Hill, Surrey; Fairlight, Hastings, Sussex; St. Minver and near Cambourne, Cornwall; Cader Idris, Merioneth.

Var. *β* **elacista** Cromb. Lich. Brit. p. 66 (1870).—Thallus effuse, thin or very thin, subleprose or rimulose, contiguous or somewhat scattered, whitish or greyish-white, often subobsolete. Apothecia minute or subminute, concave or plain, the epithalline margin pulverulent, at length naked, evanescent; otherwise

nearly as in the type.—*L. coarctata* form *elacista* Leight. Lich. Fl. p. 278 pro parte; ed. 3, p. 281 pro parte. *Parmelia elacista* Ach. Meth. p. 159, t. iv. f. 4 (1803). *Lecanora coarctata* var. δ *elacista* Mudd Man. p. 154 pro parte (1861).

Exsicc. Mudd n. 124; Larb. Lich. Hb. nos. 41, 342; Johns. n. 333.

Differs in the thinner, often subpulverulent thallus and the smaller apothecia, which are often blackish and immarginate in age. In both respects, however, it presents diversities resulting chiefly from the nature of the habitat. Thus when pulverulent the thallus is frequently little visible, when it is form *cotaria* Cromb. in Grevillea xxii. p. 9 (*Lecidea cotaria* Ach. Meth. Suppl. p. 11 (1803)). Occasionally it is entirely absent, when it is form *depauperata* Leight. Lich. Fl. ed. 3, p. 282 (1879). The apothecia in a very young state are subglobose, with the pseudo-thalline margin connivent, and concealing the epithecium; it is then form *variolosa* Leight. Lich. Fl. ed. 3, p. 282 (Flot. Lich. Siles. p. 120), having, as Acharius says (*l. c.*), the aspect of *Verrucaria leucocephala*. Very rarely this margin is persistent and more or less crenulate (form *subcrenulata* Cromb.).

Hab. On rocks, walls, and stones in maritime and mountainous districts.—*Distr* Not uncommon in most parts of Great Britain and probably also of Ireland; not found with certainty in the Channel Islands.—*B. M.* Leith Hill, Surrey; Springfield near Chelmsford, and Galleywood Common, Essex; St. Leonards and Fairlight Glen, near Hastings, Sussex; Luccomb and near Shanklin, Isle of Wight; Launceston, Withiel and Newlyn Cliff, Cornwall; Axe Edge, Buxton, Derbyshire; Ledbury, Herefordshire; Malvern, Worcestershire; Dolgelly and Cader Idris, Merioneth; near Ayton, Cleveland, Yorkshire; Eglestone, Durham; Achosragan Hill, Appin, Argyll; Ben Lawers and Craig Tulloch, Perthshire; near Portlethen, Kincardineshire; Craig Guie, Braemar, Aberdeenshire; Bantry and Kilcully, Cork; Kylemore and Doughruagh Mt., Connemara, Galway.

Var. γ **glebulosa** Cromb. Lich. Brit. p. 76 (1870) & in Grevillea xxii. p. 9.—Thallus determinate or subdeterminate, thickish, verrucose-glebulose or subsquamulose, the squamules tumid, somewhat scattered or crowded, minutely lobed at the circumference, whitish or glaucous-white. Apothecia small, plane or slightly convex, reddish-brown, becoming dark-red, the margin thin, speedily evanescent; otherwise as in the type.—*L. coarctata* f. *glebulosa*, f. *involuta* and f. *ornata* Leight. Lich. Fl. p. 279 (1871); ed. 3, p. 281. *Lichen glebulosus* Sm. Engl. Bot. t. 1955 (1809). *Lepidoma glebulosum* S. F. Gray Nat. Arr. i. p. 462 (1821). *Lecanora coarctata* var. β *ornata* Sommerf. Suppl. Fl. Lapp. p. 92 (1826); Mudd Man. p. 154 pro parte. *L. coarctata* var. β *glebulosa* Mudd and var. γ *involuta* Mudd Man. p. 154 (1861). *L. involuta* Tayl. in Mackay Fl. Hib. ii. p. 134 (1836). *Psora glebulosa* Hook. in Sm. Engl. Fl. v. p. 193 (1833).

Exsicc. Leight. n. 149; Mudd, n. 123; Larb. Lich. Hb. n. 170; Johns. n. 334.

Perhaps a subspecies, looking when best developed as if it were even a distinct species. It is then well marked, as stated by Sommer-

felt, *l. c.*, by the areolate crust being subeffigurate at the margins; in some specimens, however, to which are referable the British exsiccata, this character is not so apparent. The thallus occasionally occurs in small orbicular, scattered patches, when it is form *microphyllina* Cromb. in Grevillea *l. c.* (Fr. Lich. Europ. p. 105, sub *Parmelia*); it then somewhat resembles form *dispersa* of *Lecanora gelida* (*vide* Part I. p. 356).

Hab. On rocks and walls, rarely on the ground, in maritime and upland situations.—*Distr.* Only here and there in England, more frequently on the Grampians, Scotland; seen from only a few localities in Ireland.—*B. M.* Henfield, Sussex; near Redruth, Cornwall; Malvern Hills, Worcestershire; Cader Idris, Merioneth; Oswestry and Haughmond Hill, Shropshire; Guisboro' Moor and Cockshaw Bank, Cleveland, Yorkshire; Knitsby, Durham; King's Park, Stirling; Achosragan Hill, Appin and Ben Cruachan, Argyll; Ben Lawers, Kinnoul Hill, Trossachs, and Craig Tulloch, Perthshire; Countesswells Wood, near Aberdeen; Glen Nevis, Invernessshire; Dunkerron, Kerry; Ross, Clare; Kylemore and near Glendalough, Galway.

24. **L. prærimata** Nyl. in Flora lix. p. 235 (1876).—Thallus effuse, continuous, thinnish, rimose, the rimæ subareolate or subparallel-radiant, white or whitish, sprinkled with concolorous convex often confluent soredia (K−, CaCl + red). Apothecia superficial, small, convex, brown, the epithalline margin evanescent; spores not rightly developed.—Cromb. in Grevillea v. p. 26; Leight. Lich. Fl. ed. 3, p. 282.

Perhaps, as Nylander says (*l. c.*), only a subspecies of *L. coarctata*, differing in the character of the thallus, more especially the presence of soredia. In the single British specimen seen there are only in two instances very faint traces of an epithalline margin to the apothecia, while the spores are immature and scarcely visible.

Hab. On granitic rocks in a maritime district.—*B. M.* Jersey (the only locality).

25. **L. Brujeriana** Nyl. ex Cromb. Lich. Brit. p. 66 (1870).—Thallus effuse, thinnish, verrucose-glebulose, pale- or sordid-yellow (K−, K(CaCl) + yellow), at times subevanescent. Apothecia sessile, somewhat large, concave, brownish-black or black (epithecium K(CaCl) + reddish), the margin thickish, repand and involute; hypothecium blackish; paraphyses very slender, discrete; spores ovoid or ellipsoid, somewhat large, 0,018–21 mm. long, 0,008–11 mm. thick; hymenial gelatine tawny-yellow with iodine.—Leight. Lich. Fl. p. 281; ed. 3, p. 285. *Parmelia coarctata* var. *β Brujeriana* Schær. Lich. Helv. Exs. n. 539 (1847).

Exsicc. Leight. n. 390.

Well characterized by the pezizoid apothecia, which at once distinguish it from all states of *L. coarctata*, to which it is closely allied. The thallus is at times somewhat ochraceous, whence form *ochroides* Nyl. ex Stirton in Grevillea ii. p. 71, a state to which two of the British specimens are referable. The spores are often almost uniseriate in the narrow elongate asci.

Hab. On schistose rocks in mountainous regions.—*Distr.* Very local in N. Wales, N. England, and the S. and N. Grampians, Scotland.—*B. M.* Cader Idris, Merioneth; Force Garth, Teesdale, Durham; Ben Lawers, Perthshire.

26. **L. arridens** Nyl. in Flora lix. p. 573 (1876).—Thallus somewhat scattered, very thin, plane, cracked, white or whitish (K−, CaCl−), often evanescent. Apothecia small, somewhat plane, immarginate, irregular, bright rose-flesh-coloured, concolourous within, usually with an irregular spurious white epithalline margin; paraphyses slender, not crowded; perithecium with the epithecium and hypothecium colourless; spores ellipsoid, 0,014–18 mm. long, 0,007–0,010 mm. thick; hymenial gelatine tawny-wine-red with iodine.—Cromb. in Grevillea v. p. 106; Leight. Lich. Fl. ed. 3, p. 308.

Has a slight resemblance to states of *L. coarctata*, but differs in the absence of any thalline reactions, in the colour (persistent) of the apothecia and of the epithecium, and in the shorter spores. In one of the two specimens seen the thallus is determinate and small, with the apothecia sparingly present; and in the other it is diffuse and scarcely visible, with the apothecia more frequent.

Hab. On decomposed quartzose rocks in a mountainous district.—*B. M.* Delphi, Connemara, Galway (the only locality).

27. **L. granulosa** Schær. Spicil. p. 172 (1833).—Thallus effuse, thinnish, granulose or leprose, whitish or glaucous-grey (K + yellowish, CaCl + reddish). Apothecia moderate, appressed, plane or convex, variable in colour, brick-red, pale- or livid-brown, blackish, white within, the margin thin, entire or flexuose, pale, at length obliterated; hypothecium colourless or pale-greenish-yellow; paraphyses coherent, thickish and brownish at the apices; spores oblong-ellipsoid, 0,009–16 mm. long, 0,004–7 mm. thick; hymenial gelatine slightly bluish then reddish or sordid-violet with iodine.—*L. decolorans* Floerke in Berl. Mag. iii. p. 193 (1809); S. F. Gray Nat. Arr. i. p. 470 (1821); Hook. Fl. Scot. ii. p. 39; Mudd Man. p. 197; Cromb. Lich. Brit. p. 66; Leight. Lich. Fl. p. 261; ed. 3, p. 258. *L. quadricolor* Hook. in Sm. Engl. Fl. v. p. 182 (1833); Tayl. in Mackay Fl. Hib. ii. p. 128. *Lichen granulosus* Ehrh. Crypt. Exs. n. 145 (1785). *L. quadricolor* Dicks. Crypt. fasc. iii. p. 15, t. ix. f. 3 (1793); Engl. Bot. t. 1185; With. Arr. ed. 3, iv. p. 24 (1796). *Verrucaria decolorans* Hoffm. Deutschl. Fl. ii. p. 177 (1795).

Exsicc. Leight. nos. 59, 352; Mudd n. 165; Larb. Lich. Hb. n. 140.

Well characterized by the versicolorous apothecia, the different tints being apparently due to age; these, however, are not always present in the same specimen, some plants being merely unicolorous. On bare moorlands it often spreads extensively, and when sterile and associated with species of *Cladina* might be taken for their basal crust. When lignicolous the thallus is thinner and usually more pulverulent. The not unfrequent spermogones have the sterigmata

simple, short, with straight spermatia 0,005–6 mm. long, scarcely 0,001 mm. thick. Several varieties and forms have been enumerated by authors.

Hab. On peaty ground, not unfrequently on stumps of dead firs, rarely incrusting mosses, from upland to alpine situations.—*Distr.* General and common in Great Britain, no doubt also in Ireland, very abundant on the Grampians; not seen from the Channel Islands.—*B. M.* Epping Forest, Essex; Ightham, Kent; New Forest, Hants; Dartmoor, Devon; North Wootton Common, Norfolk; near Buxton, Derbyshire; Lickey Hills, Worcestershire; Cader Idris, Merioneth; Stiperstones Hill, Shropshire; Guisboro' Moor and Ayton Moor, Cleveland, Yorkshire; Eglestone, Durham; near Hexham, Northumberland; Pentland Hills, near Edinburgh; Achosragan Hill, Appin, Argyll; Cockhill, Callander, Craig Calliach, Ben Lawers and Rannoch, Perthshire; Clova, Forfarshire; Countesswells Wood, near Aberdeen; Glen Dee and Ben-naboord, Braemar, Aberdeenshire; Glen Nevis, Invernessshire; Lairg, Sutherland; The Storr, Island of Skye; Applecross, Rossshire; near Belfast, Antrim; Doveraile Mts., Cork; Killarney, Kerry; Delphi, Connemara, Galway.

Form 1. **saxatilis** Larb. in Leight. Lich. Flora, ed. 3, p. 259 (1879) (nomen).—Thallus very thin, the granules scattered, subevanescent. Apothecia subminute, livid-brown; otherwise as in the type.

Exsicc. Larb. Lich. Hb. n. 101.

Evidently only a depauperate state of the type, resulting from the nature of the substratum on which it is erratic. In the specimen seen the apothecia are either solitary or here and there confluent.

Hab. On moist rocks in an upland district.—*B. M.* By Lough Muck, Connemara, Galway (the only locality).

Form 2. **viridula** Cromb.—Thallus granulose-leprose, greyish-green, the granules at length deliquescent, pulverulent, yellowish. Apothecia somewhat small, blackish, solitary or confluent; otherwise as in the type.—*L. decolorans* var. γ *viridula* Mudd Man. p. 197 (1861); form *aporetica* (vix Koerb. non Ach.) Leight. Lich. Fl. ed. 3, p. 259 (1879).

Exsicc. Mudd n. 166.

Differs merely in the colour of the more leprose thallus, which is dark-green when moist. It is apparently only one of the numerous conditions of this polymorphous plant, affected by atmospheric influences.

Hab. On peaty ground in an upland tract.—*B. M.* Cliffrigg, Cleveland, Yorkshire (the only locality).

Var. β **escharoides** Schær. Enum. p. 137 (1850).—Thallus granulose-verrucose, greyish-white. Apothecia convex, subimmarginate, more or less confluent, brownish-black or black.—*L. decolorans* var. β *escharoides* Mudd Man. p. 197; form *escharoides* Leight. Lich. Fl. ed. 3, p. 258. *Lichen escharoides* Ehrh. Crypt. Exs. n. 313 (1793). *Lecidea decolorans* var. *desertorum* (Ach.?) Cromb. in Grevillea xxii. p. 9 (1893).

Differs in the thicker more developed thallus and the constantly darker apothecia, which are usually several confluent and irregular.

Hab. On peaty soil in mountainous regions.—*Distr.* Seen only from N. England and the Grampians, Scotland.—*B. M.* Ayton Moor, Cleveland, Yorkshire; Eglestone, Durham; Ben Lawers and Rannoch Moor, Perthshire; Ben Avon and Cairngorm, Braemar, Aberdeenshire.

28. **L. flexuosa** Nyl. in Mém. Soc. Cherb. v. p. 121 (1857).—Thallus effuse, thin, granulose, greenish or greyish-green (Kf + yellow, CaCl + reddish), at times subevanescent. Apothecia small, sessile, plane, black or blackish, whitish within, the margin thin, paler, often flexuose; hypothecium colourless; paraphyses brownish at the apices; spores ellipsoid, minute, 0,007–9 mm. long, 0,0035–45 mm. thick; hymenial gelatine pale-bluish then tawny-reddish with iodine.—Mudd Man. p. 196; Leight. Lich. Fl. p. 260; ed. 3, p. 256. *L. decolorans* subsp. *flexuosa* Cromb. Lich. Brit. p. 66 (1870). *Biatora flexuosa* Fr. in Vet. Ak. Handl. 1822, p. 268 (nomen) & Sched. Crit. viii. p. 11 (1826).

Exsicc. Cromb. n. 80; Larb. Lich. Hb. n. 341.

Very much resembles some lignicolous states of the preceding, of which it may be only a subspecies. It differs, however, in the constantly darker apothecia and more especially in the much smaller spores. The British specimens seen are well fertile.

Hab. On old pales and stumps of trees, chiefly larch, in upland wooded districts.—*Distr.* Rather local, though plentiful where it occurs, in Great Britain; not seen from Ireland.—*B. M.* Near Ullacombe, Bovey Tracey, Devon; Bardon Hill, Leicestershire; Haughmond Hill, Shropshire; Lounsdale, Cleveland, Yorkshire; Teesdale, Durham; Glen Falloch, Craig Calliach, and Achmore, Killin, Perthshire; Countesswells Woods, near Aberdeen.

Form **æruginosa** Leight. Lich. Fl. p. 260 (1871); ed. 3, p. 256.—Thallus leprose-pulverulent, dark verdigris-green; otherwise as in the type.—*Lecidea æruginosa* Borr. in Engl. Bot. Suppl. t. 2682 (1831); Hook. in Sm. Engl. Fl. v. p. 181. *L. flexuosa* var. *β æruginosa* Mudd Man. p. 197 (1861).

Exsicc. Leight. n. 406; Larb. Lich. Hb. nos. 65, 66.

Differs merely in the thalline granules becoming dissolved into an æruginose powder. It often occurs sterile and might then be taken for a *Lepraria*.

Hab. On old pales and on the bark of old trees in upland wooded situations.—*Distr.* Not uncommon throughout England; rare in S. Ireland; not seen from Scotland.—*B. M.* Highbeech, Epping Forest, and Chelmsford, Essex; near Mill Hill, Middlesex; Leith Hill, Surrey; Cuckfield and Henfield, Sussex; Lyndhurst, New Forest, Hants; Ullacombe, near Bovey Tracey, Devon; near Virginia Water, Berks; Brabaham Park, Cambridgeshire; North Wootton, Norfolk; Goyt Bridge, near Buxton, Derbyshire; Twycross, Leicestershire; Battenhall, Worcestershire; Morda, Oswestry, Shropshire; Baysdale, Cleveland, Yorkshire; Glenmire, Cork.

29. **L. viridescens** Ach. Meth. p. 62 (1803).—Thallus effuse, thin, minutely granulose-leprose, pale-greenish (Kf + yellowish, K(CaCl)+crimson). Apothecia minute, almost sessile, subconvex, subimmarginate, opaque, brownish- or livid-black, within dark or whitish; hypothecium pale; paraphyses slender, subconcrete; spores ellipsoid, 0,010–13 mm. long, 0,004–6 mm. thick; hymenial gelatine bluish with iodine.—Mudd Man. p. 196; Cromb. Lich. Brit. p. 67; Leight. Lich. Fl. p. 264; ed. 3, p. 262. *Lichen viridescens* Schrad. Spicil. p. 88 (1794).

Exsicc. Mudd, n. 164 (as *L. prasina*); Cromb. n. 81.

Might at first sight be taken for a lignicolous form of *L. granulosa*, from which the smaller, constantly darker apothecia, the smaller spores, &c., distinguish it. The apothecia are sometimes solitary or more frequently crowded and confluent.

Hab. On decayed trunks of trees in upland and maritime wooded districts.—*Distr.* Only a very few localities in England and the S.W. Highlands of Scotland.—*B. M.* New Forest, Hants; Hurstpierpoint, Sussex; Oaksey, Wiltshire; Oswestry, Shropshire; Hoggart's Wood, Ingleby, Yorkshire; Barcaldine, Argyll.

30. **L. gelatinosa** Floerke in Berl. Mag. 1809, p. 201.—Thallus effuse, thin, leprose-gelatinous, greenish-grey or subæruginose (K −, CaCl −), at times nearly evanescent. Apothecia submoderate, appressed, plane, blackish or livid, with thin, paler margin, at length immarginate, pale-brownish within; hypothecium colourless or pale-yellowish-brown; paraphyses slender, olive or brownish at the apices; spores ellipsoid or oblong-ellipsoid, 0,007–9 mm. long, 0,004–5 mm. thick; hymenial gelatine slightly bluish then tawny-wine-reddish with iodine.—Cromb. Lich. Brit. p. 66; Leight. Lich. Fl. p. 299; ed. 3, p. 308. *L. viridescens*, var. *β gelatinosa* Mudd Man. p. 196 (1861). *Biatora viridescens* var. *α gelatinosa* Koerb. Syst. Lich. Germ. p. 201 (1855).

Exsicc. Leight. n. 353; Larb. Lich. Hb. n. 30.

Differs from the preceding, of which it has frequently been regarded as a variety, in the thinner subgelatinous thallus, the plane apothecia and the smaller spores. The apothecia, though numerous, are somewhat scattered, becoming at length difform.

Hab. On the bare ground, rarely incrusting decaying mosses, in upland situations.—*Distr.* Very few localities in Great Britain and Ireland.—*B. M.* The Downs, Sussex; Withiel, Cornwall; Stiperstones Hill and the Wrekin, Shropshire; Guisboro' Moor and near Ayton, Cleveland, Yorkshire; Glen Falloch and Aberfeldy, Perthshire; Barcaldine, Argyll; near Bantry, Cork; Lough Muck, Connemara, Galway.

Subsp. **prasinorufa** Nyl. in Flora lxv. p. 453 (1882).—Thallus sorediose, the soredia rotundate, somewhat plane, greenish. Apothecia small, immarginate, dark-red, pale within; hypothecium colourless; spores ellipsoid, 0,009–0,010 mm. long, 0,004 mm. thick.

Differs from the type chiefly in the soredia and the colour of the fructification. In the British specimens the apothecia are sparingly present. The sterile plant is probably not uncommon in the Highlands of Scotland, where the soredia are either yellowish or subæruginose.

Hab. On turfy ground in an upland hilly district.—*B. M.* Dartmoor, Devon (the only locality).

31. **L. Wallrothii** Floerke ex Spreng. Neue Entdeckung. ii. p. 96 (1821).—Thallus effuse, thickish, appressed, granulose-squamulose, whitish or glaucous, the granules more or less scattered, or usually congested and confluent (K + yellow, K(CaCl) + red). Apothecia appressed, moderate or somewhat large, plane or convex, pale- or dark-brown, subpruinose, the margin pale, thin, inflexed; paraphyses slender; hypothecium pale; spores ellipsoid, 0,018–21 mm. long, 0,009–11 mm. thick; hymenial gelatine bluish then sordid wine-red with iodine.—Cromb. in Grevillea xxii. p. 9. *L. glebulosa* Nyl. in Act. Soc. Linn. Bord. ser. 3, i. p. 357 (1856); Cromb. Lich. Brit. p. 66 (1870). *L. Salweii* Borr. in Engl. Bot. Suppl. t. 2861 (1834); Leight. Lich. Fl. p. 249; ed. 3, p. 241. *Biatora glebulosa* Fr. Lich. Eur. p. 252 (1831) (excl. syn. Engl. Bot. t. 1955).

Exsicc. Larb. Cæsar. n. 32; Lich. Hb. n. 303; Cromb. n. 170.

A very distinct species, easily recognized by the subsquamulose thallus and slightly pruinose apothecia, which distinguish it from all states of *L. granulosa*, to which it is somewhat similar. The apothecia, at first plane and thinly margined, become at length convex, often several confluent and immarginate.

Hab. On the ground in crevices of rocks in maritime, rarely mountainous districts.—*Distr.* Rather local, though usually plentiful where it occurs in the Channel Islands, S.W. England and Wales.—*B. M.* Beaufort Bay and the Warren, Noirmont, Jersey; Saint's Bay, Guernsey; Valley of Rocks, Lynton, Devon; near Bodmin, St. Michael's Mount, Hensborrow, and near Penzance, Cornwall; near Fishguard, Pembrokeshire; banks of the Teify, Cardiganshire.

32. **L. demissa** Th. Fries Lich. Scand. p. 420 (1874).—Thallus subdeterminate, adnate-squamulose, greenish-brown or lurid-greyish, the squamules smooth, verrucose-tumid or subimbricate (K−, CaCl−); hypothallus black. Apothecia small or moderate in size, adnate, plane or convex, reddish-brown or blackish, whitish within, the margin thin, soon obliterated; paraphyses stoutish, incrassate and brown at the apices; hypothecium colourless; spores ellipsoid, 0,010–17 mm. long, 0,006–8 mm. thick; hymenial gelatine deep blue with iodine.—*L. atrorufa* Ach. Meth. p. 74 (1803) & Lich. Univ. p. 200; Carroll in Journ. Bot. iv. p. 23 (1866); Cromb. Lich. Brit. p. 67; Leight. Lich. Fl. p. 250; ed. 3, p. 242. *Lichen demissus* Rutstr. Diss. Pl. Crypt. p. 8 (1794). *L. atrorufus* Dicks. Crypt. fasc. iv. p. 22 t. 12, f. 4 (1801); Engl. Bot. t. 1102. *Lepidoma*

atrorufum S. F. Gray Nat. Arr. i. p. 461 (1821). *Psora atrorufa* Hook. in Sm. Engl. Bot. v. p. 192 (1833); Mudd Man. p. 171.

The thallus, which varies somewhat in colour according to situation, becomes in age more verrucose in the centre. The apothecia, usually somewhat scattered, are occasionally here and there confluent and difform.

Hab. On peaty and gravelly soil, very rarely on naked schistose boulders in mountainous regions.—*Distr.* Only in N. England, Wales, and on the Grampians, Scotland; not certainly found in Ireland, though reported from co. Wicklow.—*B. M.* Cader Idris and Rhinog Fach, Merioneth; Snowdon, Carnarvonshire; Farndale Moor, Yorkshire; Stavely Head, Westmoreland; Teesdale, Durham; Ben Cruachan, Argyll; Ben Lawers, near Loch Ericht and Craig Calliach, Perthshire; Lochnagar; Ben-naboord and Ben Macdhui, Braemar, Aberdeenshire; Ben Nevis, Invernessshire.

33. **L. uliginosa** Ach. Meth. p. 43 (1803) (excl. vars.) & in Vet. Ak. Handl. p. 262 (1808).—Thallus effuse, thinnish, minutely granulose, subleprose, brownish or brownish-black (K−, CaCl−); hypothallus blackish. Apothecia minute, plane or somewhat convex, brownish-black or blackish, within blackish (slightly greyish in the middle), the margin thin, paler, evanescent; paraphyses indistinct; hypothecium brown; spores ellipsoid, 0,008–17 mm. long, 0,004–8 mm. thick; hymenial gelatine bluish then tawny-wine-coloured with iodine.—S. F. Gray Nat. Arr. i. p. 467; Hook. in Sm. Engl. Fl. v. p. 179; Tayl. in Mackay Fl. Hib. ii. p. 124; Mudd Man. p. 197 pro parte; Cromb. Lich. Brit. p. 67 pro parte; Leight. Lich. Fl. p. 274 pro parte; ed. 3, p. 274 pro parte; Cromb. in Grevillea xxii. p. 9. *Lichen uliginosus* Schrad. Spicil. p. 88 (1794); Engl. Bot. t. 1466.

Exsicc. Leight. nos. 120, 354; Mudd n. 167; Cromb. n. 82; Larb. Lich. Hb. nos. 225, 265; Johns. n. 372.

Often spreads very extensively on moors, like *L. granulosa*, and in dry weather is scarcely distinguishable from the substratum. In moist shady situations the thallus is at times greenish and subgelatinose with paler apothecia; these are numerous, often crowded and confluent, becoming in age convex and here and there several aggregate.

Hab. On turfy, rarely sandy soil and mossy stumps of trees, chiefly firs, in upland and subalpine localities.—*Distr.* General and common in most parts of Great Britain and no doubt also of Ireland (*fide* Tayl. *l. c.*) though seen from only a single locality there.—*B. M.* Hayle, Cornwall; Epping Forest and Galleywood Common, near Chelmsford, Essex; Reigate Hill, Surrey; near Lyndhurst, New Forest, Hants; Dartmoor, Devonshire; Roughton, Cornwall; Broadwater and Tilgate, Sussex; North Wootton Common, Norfolk; Goyt Lane, Buxton, Derbyshire; Malvern Hills, Worcestershire; Cader Idris, Merioneth; Wrekin Hill, Stiperstones, Haughmond Hill and Gruis Hill, Shropshire; Bowdon Heath, Cheshire; Kildale Moor, Cleveland, Yorkshire; Teesdale, Durham; Windermere, Westmoreland; The Cheviots, Northumberland; Pentland Hills, near Edin-

burgh; Appin, Argyll; Craig Calliach, Ben Lawers and Rannoch Moor, Perthshire; Hill of Ardo, Kincardineshire; Morrone, Braemar, Aberdeenshire; Ben Nevis, Invernessshire; near Lairg, Sutherlandshire; Hills of Applecross, Ross-shire; Cork.

Var. β **humosa** Ach. Meth. p. 43 (1803).—Thallus very thin, leprose-granulose, the granules somewhat scattered, brownish-black. Apothecia subminute, at length convex, brownish-black or black; otherwise as in the type.—Cromb. Lich. Brit. p. 343; Leight. Lich. Fl. p. 275; ed. 3, p. 275 pro minima parte. *L. humosa* Leight. Lich. Fl. ed. 3, p. 277 (1879). *Lichen humosus* Ehrh. Pl. Crypt. Exs. n. 135 (1789) pro parte.

Exsicc. Larb. Lich. Hb. n. 308.

Differs in the colour of the thallus, which is at times almost evanescent, and in the darker more constantly convex apothecia, which are at length crowded and aggregate. In shady situations, when saxicolous, the thallus is more or less greenish. Intermediate between the type and the following species.

Hab. On the ground and on turf walls, rarely on shady rocks, in maritime and upland districts.—*Distr.* Here and there in Great Britain; rare in the Channel Islands, and in N.W. Ireland; no doubt often overlooked.—*B. M.* Near the Coupée, Island of Sark; New Forest and near Bournemouth, Hants; Leith Hill, Surrey; Dolgelly and Cader Idris, Merioneth; Ben Lawers and Rannoch, Perthshire; Hill of Ardo, near Aberdeen; Lough Inagh, Connemara, Galway (saxicolous).

34. **L. fuliginea** Ach. Syn. p. 35 (1814); Nyl. in Flora lxii. p. 206 (1879).—Thallus effuse, minutely granulose, brownish black or fuliginous, the granules globose, crowded, subscabrid (K−, CaCl−). Apothecia small, plane, marginate, the margin thin, entire, at length convex and immarginate, reddish or dark-brown; paraphyses indistinct, brownish; hypothecium yellowish-brown; spores ellipsoid, 0,008–15 mm. long, 0,004–7 mm. thick; hymenial gelatine faintly bluish, then tawny-wine-coloured with iodine.—Cromb. in Grevillea xxii. p. 9. *L. uliginosa* var. β *fuliginea* Mudd Man. p. 198 (1861); form *fuliginea* Leight. Lich. Fl. p. 274 (1871); ed. 3, p. 274.

Exsicc. Larb. Lich. Hb. n. 226.

Usually regarded as being only a lignicolous condition or a form of the preceding species, to which it is intimately related. It is, however, distinct in the generally smaller spores, and especially, as pointed out by Nylander, in the gonidia chiefly constituting syngonidia. As noticed by Acharius, the thallus very speedily imbibes water as if subgelatinous. In more shady and damp situations the plant is always sterile.

Hab. On old palings and dead wood in upland situations.—*Distr.* Here and there throughout Great Britain, and plentiful where it occurs; very rare in the Channel Islands; not seen from Ireland.—*B. M.* Island of Sark; Tuddenham, Suffolk; Epping Forest and Langford, Essex; Westwood Common, Surrey; near Penshurst, Kent; New

Forest, Hants; Dartmoor, Devon; Finchley and Millhill, Middlesex; Pondlye and Enningham, Sussex; Elstree, Herts; Gopsall Park, Leicestershire; Ombersley, near Worcester; Bilsdale, Yorkshire; Appin, Argyll; Glen Falloch, Craig Calliach, and Ben Lawers, Perthshire; Countesswells Woods, near Aberdeen; Lairg, Sutherland.

35. **L. perobscura** Nyl. in Flora lvii. p. 9 (1874).—Thallus effuse, thin, subopaque, black, brownish-black when moist (K−, CaCl−). Apothecia small, more or less scattered, somewhat convex, immarginate, black, greyish within; paraphyses coherent; epithecium brownish; hypothecium colourless; spores ellipsoid, small, 0,006–8 mm. long, about 0,0035 mm. thick; hymenial gelatine bluish with iodine.—Cromb. in Grevillea ii. p. 140; Leight. Lich. Fl. ed. 3, p. 308.

The thallus is at times very thin, becoming nearly evanescent. It is allied to *L. uliginosa*, but differs in the colour of the apothecia internally, in that of the hypothecium and in the much smaller spores.

Hab. On an old fir paling in a wooded upland district.—*B. M.* Near Killin, Perthshire (the only locality).

36. **L. epimarta** Nyl. in Flora lx. p. 226 (1877).—Thallus effuse, minutely depressed-granulate, scattered, whitish (K + yellow, CaCl−). Apothecia small, somewhat obconical, plane above, narrowed below, immarginate, brown, usually rusty-ochraceous-suffused, internally pale-dusky-ochraceous; thalamium somewhat ochraceous; paraphyses slender, scanty; hypothecium thick, solid, nearly colourless or faintly ochraceous; spores oblong, minute, 0,006–9 mm. long, 0,0025–35 mm. thick; hymenial gelatine bluish then (especially the asci) tawny-yellow with iodine.—Cromb. in Grevillea vi. p. 18; Leight. Lich. Fl. ed. 3, p. 266.

A small and singular species, readily distinguished from its more immediate allies by the form and colour of the apothecia which are somewhat crowded and prominent, appearing as if tuberculiform. As observed by Nylander, the epithecial granulations on the application of K are at once changed into raphides, a peculiar character of the plant. The spermogones are not present in the single specimen, which was associated with *Pycnothelia papillaria*.

Hab. On peaty soil in a subalpine district.—*B. M.* Achosragan Hill, Appin, Argyll (the only locality).

37. **L. æstivalis** Ohl. in Schrift. Phys. Ök. Ges. Konigsb. xi. p. 16 (1870).—Thallus effuse, thin, granulose, yellowish-green, often evanescent. Apothecia small, convex, immarginate, brownish, greyish-pruinose, colourless within; paraphyses indistinct; hypothecium colourless; spores fusiformi-oblong, 0,015–16 mm. long, 0,005–6 mm. thick; hymenial gelatine bluish then tawny-wine-red with iodine.—Cromb. in Journ. Bot. xiv. p. 361 (1876); Leight. Lich. Fl. ed. 3, p. 260.

Resembling in appearance *Bilimbia metamorphea*, of which it may perhaps be only a variety (see Ohlert, *l. c.*). It differs in the firmer apothecia and the smaller simple spores.

Hab. Incrusting mosses on walls in a maritime district.—*B. M.* Killery Bay, Connemara, Galway (the only locality).

38. **L. vernalis** Ach. Meth. p. 68 (1803) & in Vet. Akad. Handl. 1808, p. 266.—Thallus effuse, thin, unequal or subgranulose-unequal, whitish or greyish-white (K−, CaCl−), at times almost obsolete. Apothecia rather small, adnate, convex, shining, immarginate, red or pale-reddish, pale-whitish within; paraphyses yellowish-brown, indistinct; hypothecium colourless; spores oblong or ellipsoid-oblong, 0,011–23 mm. long, 0,004–7 mm. thick; hymenial gelatine slightly bluish then wine-red with iodine.—S. F. Gray Nat. Arr. i. p. 470; Carroll in Journ. Bot. iii. p. 290 (1865); Cromb. Lich. Brit. p. 68 pro parte; Leight. Lich. Fl. p. 262 pro parte; ed. 3, p. 259 pro parte; Cromb. in Grevillea xxii. p. 10. *Lichen vernalis* Linn. Syst. Nat. iii. p. 234 (1768).

Regarded by Nylander as the typical species of this section. By earlier authors it was confused with other species, especially *L. rubella*. As noted by Th. Fries (Lich. Scand. p. 429) the plant in Herb. Linnæus is a slightly aberrant form of the present species. In its more typical condition it is one of the rarest British lichens, though the subspecies that follows is rather more frequent. Our few specimens are well fertile, with the apothecia more or less crowded.

Hab. On decayed mosses upon the ground and on boulders in alpine situations.—*Distr.* Extremely local and scarce, having been gathered only very sparingly on two of the Grampians, and in the west of Scotland.—*B. M.* Above Loch-na-Gat and near the summit of Ben Lawers, Perthshire; Airds, Appin, Argyll; near the summit of Bennaboord, Braemar, Aberdeenshire.

Subsp. **minor** Nyl. ex Norrl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. xiii. p. 335 (1873).—Thallus thin or very thin, smoothish or minutely granulose, whitish or pale-greenish. Apothecia subminute, pale-testaceous; spores ellipsoid-oblong, 0,010–18 mm. long, 0,004–5 mm. thick.—*L. vernalis* form *minor* Nyl. *l. c.* v. p. 145 (1866); Cromb. Lich. Brit. p. 68; Leight. Lich. Fl. ed. 3, p. 259. *L. conglomerata* Mudd Man. p. 194 (1861); Leight. Lich. Fl. p. 260; ed. 3, p. 257. *L. subvernalis* Stirton in Grevillea iii. p. 33 (1874); Leight. Lich. Fl. ed, 3, p. 308. *Lichen conglomeratus* Heyder ex Hoffm. Deutschl. Fl. ii. p. 174 (1795).

Exsicc. Leight. n. 151; Mudd n. 162 (*fide* Nyl. in Flora xlvi. p. 78, as *L. vernalis* form *corticalis*).

Distinguished from the type by the less developed thallus which at times is subevanescent, by the smaller apothecia and spores and the different substratum. The apothecia are often several conglomerate.

Hab. On the smooth bark of trees in upland wooded districts.—*Distr.* Seen from only a few localities in England and the S. Grampians, Scotland.—*B. M.* Oswestry, Shropshire; Bathford Hill, Somerset;

Rodmarton, Gloucestershire; Yarmouth, Norfolk; Gopsall, Leicestershire; Broadwas, Worcestershire; Airyholme Wood and Cliffrig, Cleveland and Ingleby, Yorkshire; Finlarig, Killin, Perthshire.

39. **L. meiocarpa** Nyl. in Flora lix. p. 577 (1876).—Thallus effuse, very thin, granulose-leprose, greyish or greenish-white, often subevanescent (K−, CaCl−). Apothecia minute, convex, immarginate, pale-yellow, yellow-testaceous or reddish; paraphyses colourless at the apices; hypothecium brown; spores oblong, 0,007–11 mm. long, 0,003–4 mm. thick; hymenial gelatine wine-red with iodine.—Cromb. in Grevillea xxii. p. 10. *L. anomala* var. γ *minuta* Schær. Spicil. p. 170 (1833) pro parte. *L. minuta* Cromb. Lich. Brit. p. 68; Leight. Lich. Fl. p. 266; ed. 3, p. 264 pro parte. *L. effusa* Mudd Man. p. 195 (1861), (non Sm. Engl. Bot.).

A rather inconspicuous plant, resembling a diminutive state of subsp. *minor* of the preceding, but differing in the smaller apothecia and spores. The apothecia are numerous, at times somewhat crowded, becoming reddish-black in age; when they are dark-violet and somewhat whitish-pruinose, it becomes var. *sarcopisioides* Massal. Ric. Lich. p. 128 (1852); Cromb. *l. c.*, p. 69; Leight. *ll. c.*

Hab. On the trunks of trees, chiefly firs, in maritime and upland wooded tracts.—*Distr.* Local and scarce in S. and N. England.—*B. M.* Shanklin, Isle of Wight; New Forest, Hants; Penzance, Cornwall; Cliffrigg, Cleveland, Yorkshire.

40. **L. tenebricosa** Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. p. 145 (1866).—Thallus effuse, very thin, unequal, greyish-white (K−, CaCl−), usually scarcely visible. Apothecia minute, plane or convex, brown or reddish-brown, the margin thin, darker, at length obliterated; paraphyses moderate, subclavate and brown at the apices; hypothecium pale; spores oblong, 0,008–15 mm. long, 0,0040–45 mm. thick; hymenial gelatine deep-blue then sordid with iodine.—Leight. Lich. Fl. ed. 3, p. 264; Cromb. in Grevillea xxii. p. 10. *L. anomala* var. ε *tenebricosa* Ach. Lich. Univ. p. 382 (1810) pro parte (*fide* Nyl. Lich. Scand. p. 201). *L. anomala* var. *minuta* Schær. Spicil. p. 170 (1836) pro parte. *L. minuta* Massal. Ric. Lich. p. 76 (1852); Mudd Man. p. 195; Leight. Lich. Fl. p. 266 pro parte; ed. 3, p. 264 pro parte.

Exsicc. Leight. nos. 298, 326; Mudd n. 163.

A rather inconspicuous plant, which from its evanescent thallus and minute fructification is apt to be overlooked. It is, however, a good species well characterized by the analytical characters of the apothecia, though easily confused with the preceding species. The apothecia are usually somewhat scattered, and in more exposed situations become blackish.

Hab. On the trunks of trees, chiefly ash and poplars, in maritime and upland wooded districts.—*Distr.* Seen from only a very few localities in England, the S.W. Highlands of Scotland, and W. Ireland. —*B. M.* Lymington, Hants; Ullacombe, Bovey Tracey, S. Devon;

Ledbury, Herefordshire; Airyholme Wood, Cleveland, Yorkshire; Glen Falloch and Finlarig, Killin, Perthshire; Mangerton, Kerry; Lough Inagh, Connemara, Galway.

41. **L. cuprea** Sommerf. Suppl. Fl. Lapp. p. 165 (1826).—Thallus effuse, thickish, rimose-granulate, unequal, whitish (K−, CaCl−). Apothecia adnate, convex, immarginate, red-ochraceous or subferruginous, within brown (the hymenium paler); hypothecium brownish; paraphyses tawny or brownish; spores elongate- or ellipsoid-oblong, 0,009–21 mm. long, 0,003–6 mm. thick; hymenial gelatine faintly bluish then wine-red with iodine.—Cromb. Lich. Brit. p. 68 pro parte & in Grevillea xxii. p. 10; Leight. Lich. Fl. p. 273 pro parte; ed. 3, p. 273 pro parte.

Resembles *L. vernalis*, but differs in the more developed thallus and the characters given of the apothecia. These are at times conglomerate and difform.

Hab. On the ground in alpine situations.—*Distr.* Very local and scarce.—*B. M.* Ben Lawers, Perthshire; Ben Avon, Braemar, Aberdeenshire.

42. **L. Berengeriana** Th. Fr. Lich. Scand. p. 433 (1874).—Thallus effuse, thickish, granulose, continuous or diffract-rimose, the granules small, whitish or greenish-grey (K−, CaCl−). Apothecia submoderate, adnate, at first plane with thin, darker margin, at length convex, immarginate and somewhat difform, brownish-black; hypothecium dark; paraphyses colourless, incrassate and dark at the apices; spores oblong or ovoid, 0,010–18 mm. long, 0,0045–65 mm. thick; hymenial gelatine wine-red with iodine.—Cromb. in Grevillea xxii. p. 10; Leight. Lich. Fl. ed. 3, p. 273. *L. cuprea* subsp. *Berengeriana* Cromb. Lich. Brit. p. 69 (1870); Leight. Lich. Fl. ed. 3, p. 273 (1879), as var. *Biatora Berengeriana* Massal. Ric. Lich. p. 128, f. 254 (1852).

Closely related to the preceding, differing chiefly in the colour of the apothecia, the character of the paraphyses and the form of the spores.

Hab. On the ground at high altitudes in mountainous districts, very rare.—*B. M.* Ben Lawers and Mael Graedha, Perthshire; Bennaboord, Braemar, Aberdeenshire.

Var. *β* **lecanodes** Nyl. ex Cromb. in Grevillea xxii. p. 10 (1893).—Apothecia circumciss, with a whitish epithalline margin. —*L. cupreiformis* var. *lecanodes* Nyl. ex Stirton in Grevillea ii. p. 71 (1873). *L. cuprea* var. *lecanodes* Leight. Lich. Fl. ed. 3, p. 273 (1879). *L. Berengeriana* var. *perileuciza* Nyl. ex Cromb. in Journ. Bot. xx. p. 275 (1882).

Well characterized by the spuriously lecanoroid apothecia. The other characters are entirely as in the following, though the paraphyses are occasionally nearly simple.

Hab. Incrusting decayed mosses on the ground.—*B. M.* Near the summit of Ben Lawers, Perthshire (the only locality).

Subsp. **cupreiformis** Nyl. ex Hue in Rev. Bot. v. p. 92 (1888).—Thallus thin, subgranulate-concrescent, whitish. Apothecia reddish-brown or blackish; paraphyses septate, distinct at the apices; epithecium reddish; spores 0,010–18 mm. long, 0,0045–55 mm. thick.—Cromb. in Grevillea xxii. p. 10. *L. cuprea* var. *cupreiformis* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. p. 144 (1866); Cromb. Lich. Brit. p. 68; Leight. Lich. Fl. p. 273; ed. 3, p. 273. *L. vernalis* var. *β cupreiformis* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. iii. p. 90 (1857). *L. cupreiformis* Nyl. in Flora li. 347 (1868).

Differs chiefly in the character of the paraphyses and in the colour of the apothecia.

Hab. On the ground in crevices of schistose rocks.—*B. M.* Above Loch-na-Gat, Ben Lawers, Perthshire (the only locality).

43. **L. ochrococca** Nyl. in Oefvers. Vet. Ak. Förh. 1860, p. 297 & Lich. Scand. p. 206.—Thallus effuse, thin, granulose, yellow-ochraceous; the granules small, firm, contiguous or subdispersed (K−, CaCl−). Apothecia small, sessile, plane, at length convex, reddish or rusty-brown, whitish within, the margin obtuse or indistinct, paler; hypothecium pale; paraphyses concrete; spores oblong-fusiform, 0,007–10 mm. long, 0,003–4 mm. thick; hymenial gelatine bluish then, especially the asci, wine-red with iodine.—Mudd Man. p. 194; Cromb. Lich. Brit. p. 69; Leight. Lich. Fl. p. 261; ed. 3, p. 257.

Well distinguished from all allied species by the colours of the thallus and of the apothecia. It occurs elsewhere only in Norway. The thallus is occasionally evanescent, when the apothecia appear on dealbate parts of the substratum. Our British specimens are well fertile.

Hab. On the trunks of pine trees in upland tracts of mountainous regions.—*Distr.* Very local and scarce in the W. Highlands of Scotland. —*B. M.* Inverouran, Argyll; Glen Falloch, Ben Lawers, and Black Wood of Rannoch, Perthshire.

44. **L. symmictella** Nyl. in Flora li. p. 163 (1868).—Thallus obsolete, developed within the bark (hypophlœodal). Apothecia very small, adnate-sessile, convex, immarginate, at first waxy-yellow, then livid, somewhat shining; paraphyses colourless; epithecium granulose, yellowish; hypothecium colourless; spores oblong or oblong-ellipsoid, 0,004–6 mm. long, 0,0015–25 mm. thick; hymenial gelatine bluish with iodine.—Cromb. in Grevillea xxii. p. 10. *Agyrium cæsium* Fr. Syst. Mycol. ii. p. 231 (1823) (non Acharius Syn. p. 171).

Resembles an ecrustaceous state of *Lecanora symmicta* Ach., but from the character of the paraphyses belongs to this section of *Lecidea*. Though no distinct thallus is visible, yet, as observed by Th. Fries (Lich. Scand. p. 433), gonidial glomeruli are always present among the fibres of the substratum, especially in the neighbourhood of the

apothecia. In the single British specimen the apothecia are somewhat scattered.

Hab. On a decorticated fir tree in a mountainous region.—*B. M.* Glen Derry, Braemar, Aberdeenshire (the only locality).

45. **L. sanguineoatra** Ach. Meth. p. 50 (1803) pro parte; Nyl. Lich. Par. Exs. n. 52 (1855).—Thallus effuse, thin, granulose or subcontinuous, greyish or greenish-grey (K−, CaCl−), at times subobsolete. Apothecia moderate, at first plane and thinly margined, soon becoming convex and immarginate, sanguineous-black or brownish-black, within brownish-black (the hymenium paler); paraphyses deep yellow or brownish towards the apices; hypothecium thick, brown or dark-red; spores ellipsoid or oblong, 0,010–19 mm. long, 0,005–8 mm. thick; hymenial gelatine bluish then wine-red or violet with iodine.—Mudd Man. p. 198; Cromb. Lich. Brit. p. 67; Leight. Lich. Fl. p. 268; ed. 3, p. 267 pro parte. *Lichen sanguineoater* Wulfen in Jacq. Coll. iii. p. 117 (1789)?

A marked feature is, as stated by Th. Fries (Lich. Scand. p. 436), the presence of bluish or violet-coloured granules among the paraphyses. The apothecia are often crowded and at times subconfluent.

Hab. Incrusting mosses on rocks and boulders, rarely on dead wood, in mountainous regions.—*Distr.* Only here and there in N. England (Cleveland, Yorkshire), N. Wales, and on the Grampians, Scotland; and in S. Ireland.—*B. M.* Nannau, Dolgelly, Merioneth; Achosragan Hill, Appin, Argyll; Glen Falloch and Ben Lawers, Perthshire; Canlochan, Forfarshire; Morrone, Braemar, Aberdeenshire; Glen Nevis, Invernessshire; Bantry, Cork.

Subsp. **atrofusca** Nyl. ex Wainio in Medd. Soc. Faun. & Fl. Fenn. iii. p. 110 (1878).—Thallus as in the type. Apothecia small, plane, margined; the margin at times slightly flexuose, at length somewhat convex and subimmarginate, brownish-black or black; hypothecium brownish or brownish-black; spores oblong, 0,010–14 mm. long, 0,005–6 mm. thick.—Cromb. in Grevillea xxii. p. 10. *L. atrofusca* Mudd Man. p. 198 (1861); Leight. Lich. Fl. ed. 3, p. 259. *Biatora atrofusca* Flot. in Hepp Exs. n. 268 (1857). *Lecidea fusca* Cromb. Lich. Brit. p. 68 (1870) (non Schær.); Leight. Lich. Fl. p. 268; ed. 3, p. 267.

Exsicc. Dicks. Hort. Sicc. n. 99 (as *Lichen muscorum* Linn. fil.).

Differs in the planer smaller and darker apothecia, as also in the rather smaller spores. When growing at high elevations the thallus is darker, almost blackish, and but sparingly fertile. The spores are occasionally spuriously 1-septate.

Hab. On mossy rocks and mossy trunks of old trees in hilly and mountainous regions.—*Distr.* Local and scarce in Central England, N. Wales, the Highlands of Scotland, and W. Ireland.—*B. M.* Matlock, Derbyshire; Dolgelly, Merioneth; Barcaldine, Argyll; S. of Loch Tay and Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire; near Kylemore, Connemara, Galway.

Form **congesta** Cromb. MS.—Apothecia minute, convex, crowded, botryose, immarginate; otherwise as in the type.

A rather singular form, characterized by the aggregate apothecia, though in the same plants these are occasionally normal, and scattered. It is referred to by Th. Fries Lich. Scand. p. 436.

Hab. Incrusting mosses on rocks in mountainous districts.—*B. M.* Craig Calliach, Perthshire; Ben Bulben, Sligo.

Var. *β* **Templetoni** Wainio in Medd. Soc. Faun. & Fl. Fenn. x. p. 38 (1883).—Thallus as in the type. Apothecia submoderate, black, slightly shining; hypothecium thickish, brownish or reddish-black; spores oblong or obtusely fusiformi-oblong, simple or thinly 1-septate, 0,010–15 mm. long, 0,005–6 mm. thick.—*Lecidea Templetoni* Tayl. in Mackay Fl. Hib. ii. p. 123 (1836); Leight. Lich. Fl. p. 312; ed. 3, p. 329. *L. sabuletorum* var. *Templetoni* Cromb. Lich. Brit. p. 71 (1870). *Bilimbia Templetoni* Mudd Man. p. 189 (1861).

Usually regarded by British authors as a distinct species. It differs chiefly in the colour of the rather larger apothecia and the frequently uniseptate spores. The violet-coloured granules are present in the epithecium as in the type.

Hab. Incrusting decayed mosses on rocks and boulders in upland situations.—*Distr.* Seen from only a very few localities in N. Wales, the S. Grampians, Scotland, and N. Ireland.—*B. M.* Cader Idris, Merioneth; Ben Lawers, Perthshire; Invermoriston, Invernessshire; near Belfast, Antrim; Doughruagh Mt., Galway.

46. **L. semipallens** Nyl. in Flora lix. p. 234 (1876).—Thallus effuse, thin, rimulose, sordid-whitish or whitish, glaucous (K + yellowish, CaCl −). Apothecia subminute, convex, immarginate-livid or partly pale, colourless within; epithecium and hypothecium colourless; spores shortly ellipsoid, minute, 0,006–9 mm. long, 0,0035–45 mm. thick; hymenial gelatine tawny-wine-red with iodine.—Cromb. in Grevillea v. p. 26; Leight. Lich. Fl. ed. 3, p. 298.

Exsicc. Larb. Lich. Hb. n. 68.

Readily distinguished from its allies by the minute spores. Externally it is a rather inconspicuous plant from the thallus being often scarcely visible and the apothecia very small and more or less scattered. One of the specimens seen is tinged with peroxide of iron.

Hab. On quartzose and schistose rocks in streams in a mountainous region.—*Distr.* Found only in W. Ireland.—*B. M.* Near Kylemore, Lough Inagh, and Twelve Pins, Connemara, Galway.

47. **L. valentior** Nyl. in Flora lx. p. 229 (1877).—Thallus subeffuse, thin, continuous, rimose, greyish or somewhat greenish (K −, CaCl −). Apothecia small, subplane or convex, immarginate or often obtusely submarginate, brown or dark-brown, the margin when present paler; paraphyses colourless at the apices; hypothecium dark-brown; spores 0,012–17 mm. long, 0,006–8

mm. thick; hymenial gelatine bluish then violet with iodine.—Cromb. in Grevillea vi. p. 19; Leight. Lich. Fl. ed. 3, p. 267.

Perhaps only a subspecies; differs chiefly in the constantly larger spores; the substratum on which it grows is also different. The single small specimen seen is well fertile.

Hab. On wet shady rocks in a mountainous region.—*B. M.* Lough Inagh, Connemara, Galway (the only locality).

48. **L. fuscorubens** Nyl. ex Salw. in Trans. Edin. Bot. Soc. vii. p. 551 (1863).—Thallus effuse, very thin, smooth, subcontinuous, sordid-greyish (K−, CaCl−); usually obsolete. Apothecia small, sessile, plane, marginate, then convex and immarginate, brownish-black or black, within brown; hypothecium thick, brown; epithecium pale-reddish; spores ellipsoid, 0,010–14 mm. long, 0,005–9 mm. thick; hymenial gelatine bluish then wine-red with iodine.—Cromb. Lich. Brit. p. 68 pro parte; Leight. Lich. Fl. p. 300 pro parte; ed. 3, p. 310. *Biatora fuscorubens* Nyl. in Bot. Not. 1853, p. 183 pro parte.

A plant apparently little understood by authors. It is perhaps only a variety or subspecies of *L. sanguineoatra* (cf. Nyl. Lich. Env. Paris, p. 79), differing chiefly in the frequent absence of a thallus and in the nature of the habitat. The somewhat scattered apothecia are darker in more exposed situations.

Hab. On calcareous rocks in mountainous districts.—*Distr.* Extremely local and scarce in the S. Grampians, Scotland, and in S.W. Ireland.—*B. M.* Craig Tulloch, Blair Athole, Perthshire; Doughruagh Mt., Connemara, Galway.

49. **L. albohyalina** Nyl. in Flora lix. p. 577 (1876).—Thallus effuse, very thin, leprose, sordid-whitish (K−, CaCl−), often obsolete. Apothecia minute, convex or subglobose, whitish or whitish-flesh-coloured; hypothecium and paraphyses colourless; spores oblong or fusiform-oblong, simple or often 1-septate, 0,008–0,014 mm. long, 0,0025–30 mm. thick; hymenial gelatine slightly bluish then tawny-wine-red with iodine.—*L. luteola* var. *albohyalina* Nyl. Herb. Mus. Fenn. p. 89 (1859). *L. anomala* var. *albohyalina* Nyl. Lich. Scand. p. 203 (1861).

Nylander says that the plant widely differs from *L. meiocarpa*, with which it is confused by Th. Fries (Lich. Scand. p. 431). In the very few British specimens seen, the thallus is inconspicuous, and the apothecia, which are somewhat scattered, become darker in age.

Hab. On smooth bark and decorticated trunks of trees in wooded upland tracts of mountainous districts.—*Distr.* Very local and scarce in N. Wales and the S. Grampians, Scotland.—*B. M.* Dolgelly, Merioneth; Craig Calliach, Perthshire.

50. **L. immersa** Ach. Meth. p. 34 (1803).—Thallus effuse, very thin, leprose, white or greyish-white, often obsolete (K−, CaCl−). Apothecia submoderate, immersed in depressions or

pits (foveolate), plane, blackish, cæsio-pruinose or naked, within greyish in the middle, the margin thin, evanescent; paraphyses concrete; epithecium and hypothecium more or less brownish; spores ellipsoid or subellipsoid, 0,012–18 mm. long, 0,007–9 mm. thick; hymenial gelatine bluish then wine-red with iodine.—S. F. Gray Nat. Arr. i. p. 467; Hook. in Sm. Engl. Fl. v. p. 179; Tayl. in Mackay Fl. Hib. ii. p. 125. *L. calcivora* Nyl. in Ach. Soc. Linn. Bord. ser. 3, i. p. 381 (1856); Mudd Man. p. 203; Cromb. Lich. Brit. p. 81; Leight. Lich. Fl. p. 300; ed. 3, p. 310. *Lichen immersus* Web. Spicil. Fl. Goett. p. 188 (1778) pro parte; Engl. Bot. t. 193; With. Arr. ed. 3, iv. p. 6 pro parte. *L. calcivorus* Ehrh. Crypt. Exs. n. 244 (1793).

Exsicc. Leight. n. 94; Cromb. n. 184.

The thallus is but very rarely visible, being almost always confused with the substratum. When obsolete, it is indicated by more or less scattered gonidia immersed in the rock. The immersed apothecia when young resemble those of *Verrucaria immersa*, with which it is then apt to be confounded. Under the apothecia, the pits (fossulae), as stated by Nylander, present minute confused colourless thalline cellules.

Hab. On calcareous rocks and cretaceous stones in maritime and upland tracts.—*Distr.* Here and there in England and N. Wales, rare in the Highlands of Scotland and in S.E. Ireland.—*B. M.* Shiere, Surrey; above Anstey's Cove, Torquay, and Elburton, near Plymouth, Devon; Weston-super-Mare and Bathampton, Somerset; Cunning Dale, near Buxton, Derbyshire; Eglwyseg rocks, near Llangollen, Denbighshire; Great Orme's Head, Carnarvonshire; Craig-y-Rhiw, Oswestry, Shropshire; near Thirsk, Yorkshire; Teesdale, Durham; Lamplugh, Cumberland; Island of Lismore, Argyll; Ben Lawers, Perthshire; Middleton, Cork.

51. **L. Metzleri** Th. Fr. Lich. Scand. p. 478 (1874).—Thallus effuse, thin, whitish or greyish-white, usually obliterated (K−, CaCl−). Apothecia small, innate in pits (foveolate), becoming slightly prominent, blackish, naked, plane and thinly margined, at length convex, immarginate; paraphyses conglutinate, dark-brown at the apices; hypothecium pale-brownish; spores broadly oblong, 0,018–28 mm. long, 0,006–12 mm. thick; hymenial gelatine bluish then tawny-wine-red with iodine.—Leight. Lich. Fl. ed. 3, p. 311. *Biatora Metzleri* Koerb. Par. Lich. p. 162 (1860).

Very similar to the preceding, for which it might readily be taken. It differs, however, externally in the apothecia being smaller, less deeply imbedded, dark-purplish when moistened, constantly epruinose; and internally by the much larger spores. A closely allied plant is *L. chondrodes* (Massal.) Nyl., recorded as British by Leighton (Lich. Fl. ed. 3, p. 253), but Leighton's specimen belongs to the present species.

Hab. On cretaceous stones and calcareous rocks in maritime and upland tracts.—*Distr.* Only a very few localities in S. England and S. Wales.—*B. M.* The Downs, Lewes, Sussex; Shiere, Surrey; Yatton, Somerset; Giltar Point, Tenby, Pembrokeshire.

52. **L. ochracea** Wedd. in Mém. Soc. Sc. Nat. Cherb. xvii. p. 369 (1873).—Thallus effuse, very thin, subleprose, slightly rimulose, sordid-whitish, greyish-brown or brownish-ochraceous (K−, CaCl−), often scarcely visible. Apothecia sessile, small, plane, thinly margined, at length somewhat convex and immarginate, black or brownish-black; hypothecium dark-brown; epithecium tawny-brown; spores ellipsoid, 0,009–12 mm. long, 0,005–6 mm. thick; hymenial gelatine bluish then wine-red with iodine.—Cromb. in Journ. Bot. xiii. p. 141 (1875); Leight. Lich. Fl. ed. 3, p. 251. *Biatora ochracea* Hepp Flecht. Europ. n. 263 (1851). *L. subochracea* Nyl. Lich. Env. Paris Suppl. p. 5 (1897).

Exsicc. Larb. Lich. Hb. nos. 64, 137; Johns. n. 336.

Often not rightly discriminated from *L. fuscorubens*. Nylander, however, *l. c.*, says that its true affinity is with the preceding, from which it differs in the much smaller spores. The thallus is frequently obsolete, when it is form *ecrustacea* Larb. in Leight. Lich. Fl. *l. c.* In moist situations the apothecia are reddish-brown. The spermogones, rarely visible on our specimens, have the spermatia straight, cylindrical, 0,005–6 mm. long, about 0,01 mm. thick.

Hab. On calcareous rocks and flints in maritime and upland districts.—*Dist.* Occasionally in S. England, the S. Grampians, Scotland, and S. and W. Ireland.—*B. M.* Near Lewes, Sussex; Ben Lawers, Perthshire; Achosragan Hill, Appin, Argyll; near Cork; Lough Feagh, Croagh Glen, and near Kylemore, Connemara, Galway.

53. **L. turgidula** Fr. Sched. Crit. i. p. 10 (1824).—Thallus effuse, very thin, granulose or leprose-pulverulent, whitish (K−, CaCl−), often evanescent. Apothecia small, plane or convex, immarginate, black, brownish-black, or rarely reddish-brown, naked or slightly bluish-grey pruinose, within pale-whitish or dark; paraphyses brownish or blackish at the apices; hypothecium pale-brownish or sordid-dark; spores ellipsoid or ellipsoid-oblong, minute, 0,007–12 mm. long, 0,003–5 mm. thick; hymenial gelatine deep blue then dark violet with iodine.—Mudd Man. p. 201; Cromb. Lich. Brit. p. 69; Leight. Lich. Fl. p. 263; ed. 3, p. 260.

Exsicc. Mudd n. 171; Cromb. n. 83.

A variable plant as to the thallus, the colours of the apothecia and the paraphyses. The thallus, usually more or less immersed (hypophlœodal), is often in lignicolous specimens entirely obsolete, when the apothecia are erumpent between the fibres of the wood. It is then form *erumpens* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. iv. p. 232. The apothecia are numerous and either solitary or congregate. The not unfrequent spermogones are black, with spermatia 0,005–6 mm. long, about 0,001 mm. thick.

Hab. On old pales, the bark and stumps of felled trees, chiefly fir, in upland wooded situations.—*Distr.* Occasionally throughout Great Britain, but plentiful where it occurs; not seen from Ireland.—*B. M.* Shanklin, Isle of Wight; Lyndhurst, New Forest, Hants; near Bovey Tracey, Devon; Rodmorton, Gloucestershire; Dolgelly, Merioneth; Baysdale, Cleveland, Yorkshire; Glen Fender, Ben Lawers, Glen

Falloch and Black Wood of Rannoch, Perthshire; Countesswells Wood, near Aberdeen; Mar Forest, Braemar, Aberdeenshire; Rothiemurchus Woods, Invernessshire.

Var. *β* **endopella** Cromb. in Grevillea i. p. 172 (1873).—Thallus subevanescent. Apothecia naked, black, pale-brownish within; spores often 2-nucleolate; hymenial gelatine persistently bright blue with iodine.—Leight. Lich. Fl. ed. 3, p. 261. *L. endopella* Cromb. in Journ. Bot. ix. p. 178 (1871); Leight. Lich. Fl. p. 301.

Exsicc. Cromb. n. 84.

Differs, though perhaps only as a form, in the constantly naked apothecia, and more especially in the colour of the hymenial reaction. The apothecia are numerous and somewhat crowded.

Hab. On an old fir paling in an upland locality.—*B. M.* Glen Fender, Blair Athole, Perthshire (the only locality).

Var. *γ* **pithyophila** Nyl. Lich. Scand. p. 202 (1861).—Thallus as in the type, but usually in patches. Apothecia naked, convex, rugulose, sordid-bluish within; hymenial gelatine bluish then sordid-violet with iodine.—Cromb. in Grevillea *l. c.* & in Journ. Bot. xi. p. 134 (1873); Leight. Lich. Fl. *l. c.* *L. asserculorum* var. *β pithyophila* Sommerf. Suppl. Fl. Lapp. p. 154 (1826).

Characterized chiefly by the peculiar colour of the hymenium, which, as observed by Nylander, *l. c.*, is almost as in *L. mœlna*. The apothecia are subminute and crowded.

Hab. On old fir palings in upland tracts.—*Distr.* Local and scarce among the S. and Central Grampians, Scotland.—*B. M.* Achmore, Killin, and Glen Fender, Blair Athole, Perthshire.

54. **L. mœstula** Nyl. in Flora li. p. 344 (1868).—Thallus effuse, thin, flat, subgranulose, dark-greyish (K−, CaCl−), at times nearly evanescent. Apothecia subminute, plane or convex, immarginate or with obsolete margin, black, colourless within; hypothecium entirely dark-brown; epithecium colourless or sometimes dark-coloured; spores ellipsoid, small, 0,007–8 mm. long, 0,025–35 mm. thick; hymenial gelatine pale-bluish then wine-red with iodine.—Cromb. in Journ. Bot. vii. p. 48 (1869), Lich. Brit. p. 69 & in Journ. Linn. Soc. xi. p. 483 (1871); Leight. Lich. Fl. p. 269; ed. 3, p. 268.

Exsicc. Cromb. n. 85.

Approaches *L. turgidula*. The apothecia are numerous and generally crowded. The spermogones also are frequent, especially in subathalline specimens; they are black, punctiform, somewhat prominent, with short sterigmata and oblong spermatia, 0,0040–45 mm. long, 0,0015 mm. thick.

Hab. On old oak palings in wooded upland situations.—*Distr.* Very local in S. and W. England, but plentiful where it occurs.—*B. M.* Billingshurst, Sussex; near Lyndhurst, New Forest, Hants.

55. **L. submœstula** Nyl. in Flora lix. p. 235 (1876).—Thallus effuse, minutely subverrucose-granulose or subdispersed, greyish

(K−, CaCl−). Apothecia small, convex, immarginate, black, concolorous within; hypothecium thick, brown; epithecium dark-greenish; spores ellipsoid, small, 0,006–10 mm. long, 0,0035 mm. thick; hymenial gelatine bluish then tawny-wine-coloured with iodine.—Cromb. in Grevillea v. p. 26; Leight. Lich. Fl. ed. 3, p. 268.

Near the preceding, but differing, among other characters, in the more developed thallus, the darker epithecium, and the nature of the habitat. It is usually more or less overrun by young states of *Sirosiphon saxicola*. The apothecia are often 2- or several-connate.

Hab. On dry arenaceous rocks in a maritime district.—*B. M.* Near Westport, Connemara, Galway (the only locality).

56. **L. misella** Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. p. 177 (1866).—Thallus effuse, thin, minutely granulose-unequal, yellowish-green, at times subevanescent. Apothecia subminute, subinnate-sessile, convex, immarginate, brownish or brownish-black, pale violet-black within; epithecium and hypothecium subincolorous; spores ellipsoid or oblong-ellipsoid, minute, 0,007–9 mm. long, 0,0030–35 mm. thick; hymenial gelatine bluish then wine-red with iodine.—Cromb. in Grevillea i. p. 172; Leight. Lich. Fl. ed. 3, p. 265. *L. anomala* var. *misella* Nyl. Lich. Scand. p. 202 (1861). *L. melanochroza* Leight. ex Cromb. in Journ. Bot. ix. p. 178 (1871) & Lich. Fl. p. 267.

Exsicc. Cromb. n. 174.

Resembles a small state of *L. turgidula*, but differs in the colour of the often subfurfuraceous thallus, in the smaller spores and other analytical characters of the apothecia. These are numerous, occasionally somewhat crowded and at length globose. Elsewhere the plant is known only from Scandinavia and Finland.

Hab. On an old fir paling in a mountainous region.—*B. M.* Near Loch Tummel, Perthshire (the only locality).

57. **L. paucula** Nyl. in Flora lix. p. 573 (1876).—Thallus effuse, very thin, smooth, continuous, greenish or greyish-white (K−, CaCl−). Apothecia minute, convex, immarginate, livid-brown within, brown under the hymenium; paraphyses colourless at the apices; hypothecium thick, brownish-black; spores ellipsoid, 0,006–7 mm. long, about 0,003 mm. thick; hymenial gelatine tawny-wine-coloured with iodine.—Cromb. in Grevillea v. p. 106; Leight. Lich. Fl. ed. 3, p. 249.

Exsicc. Larb. Lich. Hb. n. 223.

Near *L. botryoides* Nyl., of Finland. The two specimens seen are well fertile, the apothecia not being very black as stated by Leighton.

Hab. On schistose rocks in streams in mountainous districts.—*Distr.* Found only in N.W. Ireland.—*B. M.* Near Kylemore and Twelve Pins, Connemara, Galway.

58. **L. mutabilis** Fée Ess. Crypt. ii. p. 105 (1837).—Thallus thin, membranaceous, smooth, whitish often limited by a narrow

bluish-black line. Apothecia small, scattered, reddish-brown, sessile, plane with a thin entire margin; paraphyses slender, concrete; hypothecium colourless or yellowish; spores ellipsoid or ovate, rather large, 0,014–16 mm. long, 0,008–14 mm. thick; hymenial gelatine blue with iodine.—Carroll in Nat. Hist. Rev. vi. p. 526, t. xxix. figs. 2, 3 (1859); Cromb. Lich. Brit. p. 64; Leight. Lich. Fl. p. 298; ed. 3, p. 307.

Distinguished from others in this group by the smooth, subdeterminate thallus, and by the spores which are thick-walled and very distinct.

Hab. On the bark of trees.—*Distr.* Seen from only a few localities in S. England and Ireland.—*B. M.* Tregawn, Cornwall; Hustyn's Wood and Torquay, Devon; Castle Bernard Park, Cork; Mangerton, Killarney and Blackwater Bridge, Kerry; Mount Shannon, Limerick; Killaloe, Clare.

59. **L. breadalbanensis** Stirton in Trans. Glasgow Soc. Nat. 1875, p. 87.—Thallus black or brownish-black, thin, somewhat wrinkled. Apothecia black or brownish-black, small, convex, rugose, immarginate, often conglomerate; hypothecium pale or reddish in thin section; paraphyses indistinct, conglutinate, reddish-brown at the apices; spores 4–8 in the ascus, ellipsoid, with a double epispore 0,016–22, rarely –25 mm. long, 0,011–14 mm. thick; hymenial gelatine deep-blue with iodine.—Leight. Lich. Fl. ed. 3, p. 298. Specimen not seen.

Hab. On mosses and hepatics. Collected by Dr. Stirton on Ben Lawers.

60. **L. poliodes** Nyl. in Flora lviii. p. 10 (1875).—Thallus blackish-grey or greenish-grey, thin, opaque, wrinkled, becoming rimose. Apothecia minute, blackish, convex, immarginate; hypothecium dark-reddish; paraphyses concrete; epithecium colourless; spores ellipsoid, small, 0,007–9 mm. long, 0,0025–45 mm. thick; hymenial gelatine wine-red with iodine.

Exsicc. Larb. Lich. Hb. n. 227.

Hab. On rocks in shady streams.—*B. M.* Above Lough Feagh, Connemara, Kerry (the only locality).

61. **L. rufofusca** Nyl. in Flora lii. p. 409 (1869).—Thallus effuse, whitish-yellow or brownish, thickish, forming a granulose crust with a whitish hypothallus. Apothecia small, dark-reddish-brown, plane and marginate, becoming convex and immarginate; hypothecium yellow; paraphyses concrete; epithecium yellowish-brown; spores ellipsoid-oblong, 0,0095–150 mm. long, 0,0055–65 mm. thick; hymenial gelatine wine-red with iodine.—Leight. Lich. Flora ed. 3, p. 266. *Biatora rufofusca* Anzi Catal. Lich. Sondr. p. 76 (1860).

Exsicc. Larb. Lich. Hb. n. 102.

Hab. On the barks of trees.—*B. M.* Near Kylemore, Connemara and Ballynahinch, Galway (the only localities).

62. **L. Henrica** Larb. ex Nyl. in Flora lx. p. 563 (1877).—Thallus white, tartareous, thickish, continuous, smooth, slightly rimulose (K + yellow, CaCl + yellow). Apothecia pale yellow-flesh-coloured, scattered, sessile plane or convex, with an obtuse margin or subimmarginate; hypothecium colourless; paraphyses distinct, thick, colourless at the apices; spores 4, 6 or 8 in the ascus, ellipsoid or fusiform-ellipsoid, 0,015–20 mm. long, 0,006–7 mm. thick; hymenial gelatine blue then yellow, the asci violet-yellow, with iodine.—Cromb. in Grevillea vi. p. 111; Leight. Lich. Fl. ed. 3, p. 298.

Exsicc. Larb. Lich. Hb. n. 171.

Hab. On rocks in shady localities.—*B. M.* Ravine near Kylemore, Galway (the only locality).

63. **L. rusticula** Nyl. in Flora xlix. p. 371 (1866).—Thallus effuse, granulate, the granules depressed-convex, subcrenate, smooth, glaucous-white (K + yellowish, K (CaCl) + yellow). Apothecia minute, somewhat plane, margined, black, the margin entire at length obliterated; paraphyses concrete; epithecium vaguely brownish; hypothecium brown; spores ellipsoid, 0,010–15 mm. long, 0,005–8 mm. thick; hymenial gelatine deep-blue then sordid-yellowish with iodine.—Leight. in Ann. Mag. Nat. Hist. xx. p. 407 (1867); Cromb. Lich. Brit. p. 84; Leight. Lich. Fl. p. 271; ed. 3, p. 272.

Related to *L. expansa*, but, among other differences, separated by the character of the thallus and the larger spores. The apothecia, at first concave with the margin obtuse, are but few and scattered in the small specimen seen. The spermogones have not been detected.

Hab. On quartzose rocks in mountainous districts.—*Distr.* Found only very sparingly in N. Wales and N.W. Ireland (Salrock Road, Connemara, Galway *fide* Leight. Lich. Fl. ed. 3 *l. c.*).—*B. M.* Giant's Pebbles, Cader Idris, Merioneth.

64. **L. rusticella** Nyl. in Flora lxi. p. 245 (1878).—Thallus effuse, thin, subleprose, whitish-ochraceous (K+reddish, CaCl−). Apothecia minute, convex, immarginate, black, opaque, dark within; paraphyses concrete; epithecium and hypothecium brown or brownish; spores suboblong, 0,006–9 mm. long, 0,0025–35 mm. thick; hymenial gelatine bluish then tawny-wine-red with iodine.—Cromb. in Grevillea vii. p. 97; Leight. Lich. Fl. ed. 3, p. 252.

Comparable with *L. rusticula*, but distinct in the character of the thallus and in the smaller spores. The colour of the thallus, which Nylander, *l. c.*, says may be normally greyish, is evidently due to suffusion by peroxide of iron. The apothecia are rather scattered.

Hab. On schistose stones of a wall in an upland situation.—*B. M.* Tullywhee Bridge, Connemara, Galway (the only locality).

65. **L. livescens** Leight. in Grevillea iv. p. 78 (1875).—Thallus white, granulose or granulate-verrucose (K−, CaCl+ pale-reddish), the granules scattered and dispersed on a black

predominating hypothallus. Apothecia scattered, sessile on the hypothallus, round or angular-difform, concave with a thick, black, prominent, entire or flexuose margin, the disc of a pale grey colour; hypothecium blackish-brown; paraphyses thick, brown at the apices; spores linear-oblong, minute, 0,007–3 mm. long, 0,003 mm. thick. Leight. Lich. Fl. ed. 3, p. 276.

Hab. On rocks.—*B. M.* Doughruagh Mt., Connemara, Galway (the only locality).

66. **L. tenera** Nyl. in Flora lii. p. 83 (1869).—Thallus effuse, thin, unequal or subgranulate, rimulose, greyish-green (K + yellow, CaCl −). Apothecia minute, plane, thinly margined, pale, the margin paler, nearly whitish, at length obliterated; paraphyses scanty, moderate, incrassate or clavate at the apices; epithecium and hypothecium colourless; spores oblong or subbacillar, simple or obsoletely 1-septate, 0,008–10 mm. long, 0,0015–25 mm. thick; hymenial gelatine bluish with iodine.—Cromb. in Journ. Bot. vii. p. 232 (1869) & Lich. Brit. p. 70; Leight. Lich. Fl. p. 259. *Lecanora tenera* Cromb. in Grevillea iii. p. 82 (1874); Leight. Lich. Fl. ed. 3, p. 188.

Exsicc. Cromb. n. 68; Larb. Lich. Hb. nos. 18, 93.

Resembles *Lecanora* in the pseudo-lecanoroid (egonidial) margin of the apothecia. The thallus spreads very extensively over the substratum, but is rarely well fertile, the apothecia being generally much scattered. Occasionally the thalline granules are depressed and more or less dispersed (form *explanatula* Nyl. *fide* Leight. Lich. Fl. ed. 3, *l. c.*), but this is seen in otherwise typical specimens. The spermogones are frequent, colourless, with spermatia oblong, 0·004–5 mm. long, 0,0015 mm. thick.

Hab. On shady rocks, granitic and quartzose, in maritime tracts. —*Distr.* Found only in the Channel Islands, N.E. Scotland, and N.W. Ireland.—*B. M.* La Moye and Boulay Bay, Jersey; near Bay of Nigg, Kincardineshire; Letterbeg, Connemara, Galway.

67. **L. antrophila** Larb. ex Leight. in Trans. Linn. Soc. ser. 2, i. p. 242, t. xxxiii. figs. 10 & 11 (1878).—Thallus yellowish-green, thin, effuse, pulverulent-furfuraceous (K −, CaCl −). Apothecia yellowish-red, small, scattered, sessile, excessively convex and prominent, with only a pale narrow margin when wetted; hypothecium thick, dark yellowish-red; paraphyses indistinct, colourless; spores linear or linear-oblong, minute, 0,009 mm. long, 0,0025 mm. thick; hymenial gelatine pale-blue with iodine.—Leight. Lich. Fl. ed. 3, p. 252.

Hab. On the interior of caves.—*B. M.* Mwellan near Kylemore, Galway (the only locality).

68. **L. picila** Leight. Lich. Fl., ed. 3, p. 251 (1879).—Thallus dirty yellowish-white, thin, effuse, furfuraceous. Apothecia black, sessile, plane or hemispherical, confluent, marginate,

when wet transparent pale-brown; hypothecium black; paraphyses thickish, coherent; spores minute oblong, 0,009 mm. long, 0,002–3 mm. thick.—*Biatora picila* Massal. Misc. Lich. p. 38 (1856).

Exsicc. Larb. Lich. Hb. n. 264.

The spores in the British specimens are larger than the size given by Massalongo, measuring up to 0,012 mm.; in the specimens examined from Craig Tulloch and Twelve Pins, they are mostly simple but occasionally 1-septate.

Hab. On rocks in upland regions.—*Distr.* Somewhat local and rare in the Scottish Highlands and S.W. Ireland.—*B. M.* Craig Tulloch, Blair Athole, Perthshire; Derryclare and Twelve Pins, Connemara, Galway.

69. **L. indigula** Nyl. in Flora lx. p. 563 (1877).—Thallus effuse, thin, continuous, rugulose, whitish, often scarcely visible (K−, CaCl−). Apothecia small, subprominent, plane, thinly margined, blackish, concolorous within; paraphyses slender, colourless at the apices; hypothecium reddish, the upper subhymenial portion thick, blackish; spores ellipsoid, 0,013–16 mm. long, 0,006–7 mm. thick; hymenial gelatine pale-bluish then wine-red with iodine.—Cromb. in Grevillea vi. p. 112; Leight. Lich. Fl. ed. 3, p. 307.

Related to *L. sanguineoatra*, but well separated from this and its other British allies by the colour of the hypothecium above. In the single small specimen seen, the apothecia are numerous, subminute, at length convex and immarginate.

Hab. On schistose stones of a wall in a mountainous district.—*B. M.* Glencorbot, near Kylemore, Galway (the only locality).

70. **L. micrococca** Nyl. in Flora lxiv. p. 7 (1881).—Thallus effuse, thin, leprose, dark or bright green (K−, CaCl−). Apothecia very minute, innato-sessile, subglobose, immarginate, pale-yellow testaceous; paraphyses conglutinate; epithecium and hypothecium colourless; spores oblong or elongate-oblong, simple or ? 1-septate, 0,009–12 mm. long, 0,003–4 mm. thick; hymenial gelatine bluish then tawny-wine-red with iodine.—Cromb. in Journ. Bot. xiv. p. 361 (1876); Leight. Lich. Fl. ed. 3, p. 257. *Biatora micrococca* Koerb. Par. Lich. p. 155 (1860).

Exsicc. Larb. Lich. Hb. n. 139.

Closely related to *Biatorina prasina*, from which it is distinguished chiefly by the differently coloured and more globose apothecia and by the simple spores. The Irish specimens seen are for the most part well fertile.

Hab. On decayed stumps of holly in a mountainous district.—*B. M.* Lough Inagh, Connemara, Galway (the only locality).

71. **L. botryiza** Nyl. ex Stirton in Grevillea ii. p. 71 (1873). Thallus effuse, thin, minutely areolate-rimulose, greenish-white (K−, CaCl−). Apothecia small, superficial,

somewhat prominent, convex, simple or conglomerate and verrucose, brown, dark within; paraphyses coherent; epithecium colourless; hypothecium brown; spores ellipsoid, 0,006–9 mm. long, 0,0035–45 mm. thick; hymenial gelatine tawny-wine-red with iodine.—Leight. Lich. Fl. ed. 3, p. 247.

Closely allied to *L. botryocarpa* Nyl., which does not occur in Great Britain, externally agreeing with it in the thallus and apothecia. The thallus looks as if minutely appresso-squamulose, and, as Nylander states, the hypothecia are confluent in one common brown hypothecium in each glomerule of the apothecia. British specimen not seen.

Hab. On schistose rocks in a mountainous district.—*Distr.* Extremely local and scarce on the S. Grampians, Scotland (Ben Voirlich, Perthshire).

72. **L. grumosa** Leight. in Trans. Linn. Soc. ser. 2, i. p. 242, t. xxxiii. figs. 7 & 9 (1878).—Thallus evanescent. Apothecia reddish-brown, minute, scattered, adnate, sessile, somewhat convex, the slight margin soon obliterated; hypothecium colourless; hymenium yellow, grumous; paraphyses indistinct, colourless; spores oblong, with granular contents, 0,013–15 mm. long, 0,007–9 mm. thick; hymenial gelatine blue then yellowish with iodine.—Leight. Lich. Fl. ed. 3, p. 309. Specimen not seen.

Hab. On pine bark, rare. Collected by Larbalestier at Ballinahinch, Galway.

73. **L. callicarpa** Larb. ex Leight. Lich. Fl. ed. 3, p. 266 (1879). — Thallus pale-whitish sulphur-coloured, pulverulent, granular, effuse (K−, CaCl− then reddish). Apothecia pallid flesh-coloured, minute, clustered or scattered, convex, somewhat pruinose, immarginate; hypothecium colourless; paraphyses coherent, apices colourless; spores not seen. Specimen not seen.

Hab. On damp perpendicular rocks at Glencorbot, near Kylemore, Galway.

74. **L. leptostigma** Nyl. in Flora li. p. 344 (1868).—Thallus subdeterminate, somewhat thick, rimulose, greyish-white (K−, CaCl−). Apothecia small, innate, thin, gregarious, brownish-black; paraphyses moderate, thickened upwards, sordid-yellow towards the apices; hypothecium pale-yellowish; asci cylindrical; spores globose or globoso-ellipsoid, uniserate, 0,005–9 mm. in diameter; hymenial gelatine not tinged with iodine.—Cromb. in Journ. Bot. vii. p. 49 (1869) & Lich. Brit. p. 76; Leight. Lich. Fl. p. 356; ed. 3, p. 385.

A rather obscure plant, differing from the other species of this sub-section in the form of the spores and the other characters given. The thallus, however, in all probability is not proper. In this case, and from the absence of any reaction of the hymenial

gelatine, the numerous parasitic apothecia would perhaps rather belong to the Fungi.

Hab. On a mica-schistose boulder in a subalpine situation.—*B. M.* Near Loch-na-Gat, Ben Lawers, Perthshire (the only locality).

75. **L. calpodes** Stirton in Trans. Glasgow Soc. Nat. 1875, p. 88.—Thallus dark-grey, cracked-areolate, the areolæ somewhat convex, contiguous or dispersed. Apothecia black, minute, numerous, innate-sessile, concave, suburceolate, acutely margined, becoming plane; hypothecium brown or pallid-brown, thin; paraphyses irregular, indistinct, branching, brownish at the apices; spores ellipsoid, almost spherical, 0,007–9 mm. long, 0,006–7 mm. thick; hymenial gelatine slightly blue then wine-red with iodine. —Leight. Lich. Fl. ed. 3, p. 288. Specimen not seen.

Hab. On rocks.

Collected by Dr. Stirton at Killiecrankie, Perthshire.

76. **L. rubidula** Nyl. in Flora lxvii. p. 214 (1884).—Thallus effuse, scarcely visible. Apothecia small, subglobose, ferruginous-red; subconcolorous within; hypothecium not dark; paraphyses slender, not well discrete; epithecium tawny-ochraceous (K+ purplish); asci saccate; spores globose, 0,006–7 mm. in diameter; hymenial gelatine pale-bluish then tawny-wine-red with iodine. Specimen not seen.

A well-marked species with much of the aspect of *Biatorella ochrophora*. Nylander observes that the thalamium and hypothecium contain chrysophanic acid, though in less degree than the epithecium. Originally found in Behring's Straits, it has since been detected sparingly in Yorkshire (*fide* Nyl. Lich. Labuan et Singapore, p. 44).

Hab. On calcareous rocks in a hilly district.—*Distr.* Only in N. England (Hebden, Yorkshire).

§ iii. EULECIDEA Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. p. 157 (1866) (Pl. 7).

Thallus very variable, at times evanescent or entirely absent. Apothecia lecideine, plane or convex, black, rarely brownish-black; asci usually 8– spored; spores simple, rarely 1–septate, colourless or brownish. Spermogones with simple or simplish sterigmata and straight occasionally arcuate spermatia.

Contains a large number of species growing, with few exceptions, on rocks, stones or earth, and occurring most frequently in upland or alpine regions. The apothecia are usually black and carbonaceous, though sometimes coloured and almost biatorine.

77. **L. protrusa** Fr. Lich. Eur. p. 324 (1831).—Thallus effuse, pale, sulphur-coloured, thickish, crustaceous, granular-verrucose, the granules contiguous or scattered, sometimes sorediate (K + yellow, CaCl + orange-red). Apothecia black, numerous,

often confluent, innate-sessile, plane then convex, the thin smooth entire margin eventually obliterated; hypothecium reddish-brown; paraphyses loosely coherent, blackish-green at the tips; spores oblong-ellipsoid, 0,011–14 mm. long, 0,007–8 mm. thick; hymenial gelatine blue with iodine.—Mudd Man. p. 207; Leight. Lich. Fl. p. 271; ed. 3, p. 270. *L. scabra* Tayl. in Mackay Fl. Hib. ii. p. 121 (1836). *L. enterochlora* Tayl. ex Leight. Lich. Fl. 271; ed. 3, p. 271.

Exsicc. Leight. n. 299; Larb. Lich. Hb. n. 67; Johns. n. 378.

Hab. On rocks and stones in maritime and upland districts.—*Distr.* Rather frequent in England and Wales, rare in the Channel Islands, Scotland and S.W. Ireland.—*B. M.* Trinity, Jersey; near Penzance, Cornwall; Whitesand Bay; East Lyn and Torquay, Devon; Boro' Green, Kent; Barmouth, Merioneth; Pwlheli, Carnarvonshire; Ayton and Langbaurghrigg, Cleveland, Yorkshire; near Rigg, Kincardineshire; Derriquin, Kerry; Ballinakill and Cloghan, Connemara, Galway; Cliffs of Moher, Clare.

Form **meiococca** A. L. Sm.—Thallus similar to the type. Apothecia paler, somewhat reddish-brown; paraphyses distinct, colourless at the tips.—*Lecidea meiococca* Leight. Lich. Fl. ed. 3, p. 277 (1879). *L. scabra* f. *meiococca* Nyl. in Flora lix. p. 578 (1876).

Exsicc. Larb. Lich. Hb., without number.

Hab. On maritime rocks.—*Distr.* Rare in N.E. Scotland and N.W. Ireland.—*B. M.* Nigg, Kincardineshire; Lettermore and Ballinakill Bay, Connemara, Galway.

Var. **subviridans** A. L. Sm.—Thallus sulphur-yellow, thin, sometimes scattered, sorediate.—*L. continuior* var. *subviridans* Nyl. in Flora xl. p. 463 (1877); Cromb. in Grevillea vi. p. 13; Leight. Lich. Fl. ed. 3, p. 278.

Nylander described the variety on specimens sent by Larbalestier; two specimens from Larbalestier in the British Museum differ from *L. protrusa* only in the more brightly coloured and more sorediate thallus.

Hab. On walls.—*B. M.* Lough Feagh, Connemara, Galway (the only locality).

78. **L. dubia** Hook. in Sm. Engl. Flora v. p. 176 (1833).—Thallus effuse, subleprose, pale-greenish, extremely pulverulent or almost smooth and minutely areolate (K + yellow, CaCl + orange-red). Apothecia black, usually numerous, scattered or confluent, subsessile, plane, becoming convex and immarginate, the disc smooth or granular; hypothecium somewhat brownish; paraphyses distinct, bluish-green at the apices, the colour extending downwards; spores oblong, 0,014 mm. long, 0,007 mm. thick; hymenial gelatine deep-blue with iodine.—Tayl. in Mackay Fl. Hib. ii. p. 120 (1836); Leight. Lich. Fl.

p. 263; ed. 3, p. 260. *Lichen dubius* Sm. Engl. Bot. t. 2547 (1814).

The type specimen was renamed by Nylander *L. parasema* var. *flavens*, and another specimen in the Sowerby herbarium was similarly labelled by Crombie. Our specimens form a well connected series in which the surface of the thallus varies from being almost smooth to completely powdery. They also differ from *L. parasema* in the larger and more crowded apothecia.

Hab. On old palings.—*Dist.* Local and not uncommon in the S. of England, extending as far north as Cambridgeshire.—*B. M.* Near Penzance, Cornwall; Penshurst, Kent; Shiere, Surrey; Ulting and Chalk End, Essex; Finchley, Middlesex; Great Comberton, Worcestershire; Oakington, Cambridgeshire.

79. **L. sporadiza** Stirton in Grevillea iii. p. 33 (1874).—Thallus yellow or greenish-yellow, granular, the granules often conglomerate or pulverulent (K + yellow, CaCl + orange-red). Apothecia black, sessile, small or medium-sized plane, rugose, marginate; hypothecium colourless; paraphyses few, irregular, indistinct; spores ellipsoid, small, 0,006–7 mm. long, 0,004–6 mm. thick; hymenial gelatine not stained with iodine.—Leight. Lich. Fl. ed. 3, p. 266. Specimen not seen.

Said by Stirton to be allied to *L. neglecta*, but judging from the description its place seems to be here.

Hab. On old worked wood. Collected by Dr. Stirton near Grantown, Inverness.

80. **L. parasema** Ach. Meth. Lich. p. 35 (1803) pro parte; Nyl. in Bot. Not. (1852) p. 175 & Lich. Scand. p. 217 pro parte.—Thallus determinate or subdeterminate, thin or thinnish, granulose or rather smooth, whitish or grey coloured (K + yellowish, CaCl−, K (CaCl) + orange-red); hypothallus black, at times limiting the thallus. Apothecia small, at first plane and thinly margined, at length somewhat convex and immarginate, black, within blackish, greyish under the epithecium; paraphyses subcoherent, dark-bluish-green at the apices; hypothecium brownish; spores ellipsoid, 0,010–16 mm. long, 0,005–8 mm. thick; hymenial gelatine bluish then dark-violet with iodine—Hook. in Sm. Engl. Fl. v. p. 176 (1833); Tayl. in Mackay Fl. Hib. ii. p. 119; Mudd Man. p. 200 pro parte; Cromb. Lich. Brit. p. 77 pro parte; Leight. Lich. Fl. p. 269; ed. 3, p. 268. *Lichen parasemus* Ach. Lich. Suec. Prod. p. 64 (1798) pro parte. *Lichenoides leprosum, crusta cinereo-virescente*, &c., Dill. Hist. Musc. p. 126, t. 18, f. 3 (1741) pro parte.

Exsicc. Leight. nos. 308, 327; Johns. nos. 346, 379.

The species as here understood includes only corticolous forms. Those growing on rocks, formerly considered as varieties, differ considerably in the thallus or in the apothecia, and are dealt with under the species that follow. When the thallus is almost or quite evanescent it is var. *ecrustacea* Leight. Lich. Fl. ed. 3, p. 270.

Hab. On the trunks of trees, and on old palings.—*Distr.* Common throughout the British Isles.—*B. M.* Ullacombe, near Bovey Tracey, Devon; near Lyndhurst, Hants; Shiere, Surrey; Langford, Stansted, Mount Fitchet Park, Sussex; Bellleigh, near Maldon, Ulting and Hadleigh Wood, Essex; near Malvern, Worcestershire; Gopsal Park, Leicestershire; Limekiln Wood, Wrekin, Caer Caradoc and Llanymynech, Shropshire; Hart Hill and Matlock, Derbyshire; Cymbychan, Dolgelly and Barmouth, Merioneth; Trefriw, Carnarvonshire; Easby, Yorkshire; trees on Roman wall, Northumberland; Falls of Bruar, Blair Athole and Glen Ogle, Perthshire; Barcaldine, Lorne and Appin, Argyll; Banchory, Aberdeenshire; Rostellan, Cork; Connemara, Galway.

Form **tabescens** Stizenb. in St. Gall. Ber. Nat. Ges. 1882, p. 432.—Thallus effuse, very thin, subleprose or subrimulose, greyish- or yellowish-green; hypothallus indistinct. Apothecia adnate or at times subinnate, convex, immarginate, difform, livid-brown.—*L. parasema* var. Leight. Lich. Fl. ed. 3, p. 269 (1879). *Biatora tabescens* Koerb. Syst. Lich. Germ. p. 203 (1855).

Exsicc. Leight. n. 329.

Differs in the less developed thallus, the absence of a hypothallus and in the colour of the more or less difform apothecia.

Hab. On smooth trunks of beech trees in wooded upland tracts.—*Distr.* Seen from only a very few localities in S. and N. England.—*B. M.* Lyndhurst, New Forest, Hants; near Frampton, Dorsetshire; Airyholme Wood, Cleveland, Yorkshire.

Var. **flavens** Nyl. Lich. Scand. p. 217 (1861).—Similar to the type but the thallus yellow, the apothecia internally whitish, and the hypothecium almost colourless.—Cromb. Lich. Brit. p. 77; Leight. Lich. Fl. p. 270; ed. 3, p. 269.

Hab. On the trunks of trees, rarely on soil.—*Distr.* Rare in the southern counties of England and in E. and N. Scotland, not recorded from the Channel Islands or from Ireland.—*B. M.* Ilsham Valley, Torquay, Devon; New Forest, Hants; Windsor Great Park, Berks; Portlethen, Forfarshire; Glen Girnac, Braemar, Aberdeenshire; Applecross House, Ross.

Var. **elæochroma** Ach. Meth. p. 36 (1803) pro parte; Nyl. Lich. Scand. p. 217.—Thallus determinate or subeffuse, thin, yellowish, yellowish-grey or olivaceous. Apothecia black, livid-black, or partly dark-reddish or dark-bluish-green, within greyish-white; hypothecium pale or yellowish-brown.—Mudd Man. p. 200; Cromb. Lich. Brit. p. 77; Leight. Lich. Fl. p. 270; ed. 3, p. 269. *L. elæochroma*, Tayl. in Mackay, Fl. Hib. ii. p. 119 (1836). *L. enteroleuca* Ach. Lich. Univ. p. 177 (1810). *L. parasema* var. *enteroleuca* Nyl. Lich. Scand. p. 217 (1861) pro parte corticolo; Mudd Man. p. 201; Cromb. Lich. Brit. p. 77. *Lichen parasemus* Sm. Engl. Bot. t. 1450 (1805). *Lichenoides leprosum*, &c., Dill. Hist. Musc. p. 126 (1740) pro parte.

Exsicc. Cromb. n. 181; Leight. nos. 126, 137, 328; Mudd nos. 169, 170; Baxt. Stirp. Crypt. Ox. n. 19; Bohl. n. 45; Johns. n. 345.

Distinguished from the type by the differently coloured thallus and apothecia which at first sight would almost seem to render it specifically distinct. The apothecia are usually smaller and more numerous than in the type. When the thallus is limited and intersected by the hypothallus in frequent black serpentine lines, it is var. *limitata* Ach. Lich. Univ. p. 175 (1810) pro parte; Cromb. Lich. Brit. p. 77.

Hab. On trees.—*Distr.* Common throughout the British Isles.—*B. M.* Sark; Tregawn and Withiel, Cornwall; Newton Bushell, Ilsham, Torquay; Ullacombe, near Bovey Tracey, Devon; New Forest, Hants; St. Leonard's Forest, and Fairlight, near Hastings, Sussex; Shiere, Surrey; Lydd, Kent; Epping Forest, Essex; Oxford; Twycross, Leicestershire; near Bath, Somerset; near Shrewsbury and Oswestry, Shropshire; Malvern, Worcestershire; Barmouth and Dolgelly, Merioneth; Haileywood, Cirencester, Gloucestershire; Abergavenny, Monmouthshire; near Ayton, Cleveland, Yorkshire; Baldoran Woods, Forfarshire; Glen Lochay, Killin, Perthshire (var. *limitata*); Morrone, Braemar, Aberdeenshire; near Inverary, Argyll; Applecross, Ross.

81. **L. latypea** Ach. Meth. Suppl. p. 10 (1803).—Thallus effuse, thickish, unequal, granular-areolate, whitish or greyish-white (K + yellow, CaCl + orange-red); hypothallus usually obsolete. Apothecia small or sometimes rather large, black, plane with a thin margin becoming convex and immarginate; hypothecium thick, brownish or dark-brown; paraphyses subcoherent, dark-bluish-green or almost black at the tips; spores ellipsoid, 0,010–15 mm. long, 0,005–8 mm. thick.—*L. parasema* var. *latypea* Nyl. Lich. Scand. p. 217 (1861); Cromb. Lich. Brit. p. 77; Leight. Lich. Fl. p. 269; ed. 3, p. 270. *L. coniops* Mudd Man. p. 201 (1861), (non Wahl). *L. continuior* Nyl. in Flora lx. p. 463 (excl. var.) (1877); Leight. Lich. Fl. ed. 3, p. 277.

Exsicc. Larb. Lich. Hb. n. 103.

Differs from *L. parasema* in habitat, in the thicker granular thallus which is either conglomerate or broken up and scattered, and in the somewhat darker hypothecium. The apothecia are plane and scattered or sometimes subconfluent with the margin evanescent. I have not seen specimens of *L. continuior;* Nylander says it differs only in the rather flat rimose-areolate thallus and the more rapid reaction with hypochlorite of lime.

Hab. On granitic and schistose rocks in maritime and upland districts.—*Distr.* Somewhat general throughout Great Britain.—*B. M.* Islands of Alderney and Sark; Vale Castle, Guernsey: Mount Orgueil Castle, Jersey; Bolt Head, and near Plymouth, Devon; Gerrans, and near Penzance, Cornwall; Bellleigh, near Maldon and Ulting, Essex; near Norton, and near Malvern, Worcestershire; Langbaurghrigg, and near Ayton, Cleveland, Yorkshire; Aberdovey, Merioneth; Barcaldine, Argyll; Nigg and Portlethen, Kincardineshire; Ben Lawers, Perthshire; Sybil Head, Kerry; Dawros Cliffs, near Kylemore, and near Letterfrack, Connemara, Galway; Lambay Island, Dublin; Borris, Carlow.

Form **latypiza** A. L. Sm.—Thallus subcinereous, effuse (K + yellow, CaCl −).—*L. parasema* subsp. *latypiza* Nyl. in Bull. Soc. Linn. Norm. ser. 2, vi. p. 310 (1872); var. *latypea* f. *latypiza* Leight. Lich. Fl. ed. 3, p. 270 (1879).

Differs from the type in the colour reaction and in the somewhat greyer more effuse thallus.

Hab. On rocks.—*B. M.* Twelve Pins, Connemara, Galway (the only locality).

82. **L. sublatypea** Leight. Lich. Fl. p. 271 (1871).—Thallus effuse or subdeterminate, subareolate or unequally granular and scattered, greyish-white (K−, CaCl−); hypothallus black, visible at intervals and giving the whole lichen a dark appearance. Apothecia small, sessile, concave, blackish, with a thickish somewhat shining, entire margin; hypothecium blackish-brown; paraphyses not well discrete, dark bluish-green or brownish-black at the tips; spores ellipsoid or oblong-ellipsoid, 0,010–12 mm. long, 0,004–6 mm. thick; hymenial gelatine deep blue with iodine.—Cromb. in Journ. Bot. ix. p. 178 (1871); Leight. Lich. Fl. ed. 3, p. 271. *L. latypodes* Nyl. in Flora lv. p. 356 (1872); Cromb. in Journ. Bot. xi. p. 134 (1873).

Exsicc. Cromb. n. 88.

Externally somewhat resembles *L. latypea*, though with a thinner and darker thallus; also distinguished by the smaller spores and by the negative chemical reactions of the thallus.

Hab. On schistose rocks.—*Distr.* Somewhat rare in mountainous regions of Wales and Scotland.—*B. M.* Llyn Aran, Cader Idris, Merioneth; Glen Fender and Craig Tulloch, Blair Athole and Ben Lawers, Perthshire; Achosragan Hill, Argyll; Glen Callater, Braemar, Aberdeenshire.

83. **L. goniophila** Schær. Enum. p. 127 (1850).—Thallus effuse, thin, granulose-rimulose, greyish or brownish (K + yellow, CaCl−). Apothecia black, small, numerous, crowded or scattered, sessile, plane, with a thin margin, becoming convex and immarginate; hypothecium colourless or yellowish; paraphyses loosely coherent, greenish-black or brown at the tips, the green colour sometimes permeating downwards; spores ellipsoid, 0,012–16 mm. long, 0,006–8 mm. thick; hymenial gelatine blue then sordid-wine-red with iodine; spermatia straight, 0,011–15 mm. long, 0,0005–6 mm. thick (*fide* Nyl. Lich. Env. Paris, p. 91 (1896)).—Mudd Man. p. 202; Cromb. Lich. Brit. p. 78 (under *L. parasema*). *L. immersa* var. *goniophila* Floerke in Berl. Mag. iii. p. 311 (1809). *L. pungens* Leight. Lich. Fl. ed. 3, p. 251 (1879) (cf. Nyl. in Flora lxiv. p. 188 (1881)). *L. parasema* var. *enteroleuca* Nyl. Lich. Scand. p. 217 (1861) pro parte. *L. enteroleuca* Leight. Lich. Fl. p. 265 (1871); ed. 3, p. 263 (non Ach.). *Biatora pungens* Koerb. Par. Lich. p. 161 (1865).

Exsicc. Mudd. n. 172; Leight. n. 330.

Differs from *L. latypea* in the much thinner, more furfuraceous thallus, and in the usually almost colourless hypothecium. Acharius' species *L. enteroleuca* (Lich. Univ. p. 177 (1810)) grows on trees and is included under *L. parasema* var. *elæochroma*.

Hab. On rocks and stone walls.—*Distr.* Frequent in all parts of the British Isles.—*B. M.* St. Lawrence, Isle of Wight; Ardingly Rocks, St. Leonard's Forest, Sussex; Ulting, Essex; near Bath, Somerset; Cirencester, Gloucestershire; Llandyssil, Cardinganshire; near Oswestry and Tong Priory, Shropshire; Barmouth and Dolgelly, Merioneth; Capel Curig, Carnarvonshire; Shawswell, Gloucestershire; Ayton, Cleveland and near Battersby, Yorkshire; Lamplugh, Cockermouth, Cumberland; Glen Tilt, Craig Calliach and Craig Tulloch, Blair Athole, Perthshire; Barcaldine, Argyll; near Kylemore, Connemara and Lough Cooter, Galway.

Var. *β* **acervata** Mudd Man. p. 202 (1861).—Thallus effuse, greyish-white, granular, the granules becoming more or less pulverulent and greenish-yellow. Apothecia small, aggregated into clusters of 4 to 20, at first plane and marginate, becoming convex and immarginate; paraphyses lax, black at the tips.

Exsicc. Mudd n. 173.

Hab. On rocks and stones in mountainous districts.—*B. M.* Frequent at Highcliff, Cleveland, Yorkshire (the only locality).

84. **L. inserena** Nyl. in Flora, lii. p. 84 (1869).—Thallus thickish, cinereous, grey, rimose-areolate or areolate-granulose, the areolæ plane, often occurring as scattered granules on a black hypothallus. Apothecia black, plane or slightly convex; hypothecium colourless, with an opaque white stratum in the lower portion; paraphyses indistinct, blackish-olive at the tips; spores ellipsoid, oblong, 0,014–17 mm. long, 0,006–8 mm. thick; hymenial gelatine blue, the asci becoming violet-coloured, with iodine.—Cromb. in Journ. Bot. vii. p. 107; Lich. Brit. p. 85; Leight. Lich. Fl. p. 278; ed. 3, p. 280.

Resembling somewhat tumid forms of *L. tenebrosa*, but well distinguished by the colourless hypothecium.

Hab. On granite rocks.—*Distr.* Very rare on the Grampians, Scotland.—*B. M.* Ben Lawers, Perthshire; Craig Guie and Morrone, Braemar, Aberdeenshire.

85. **L. viridans** Koerb. Syst. Lich. Germ. p. 242 (1855).—Thallus effuse, thin, minutely granulose, yellowish-green or sordid-greenish (Kf + yellowish, CaCl − K(CaCl) + orange-red); hypothallus evanescent. Apothecia small, innate-sessile, at first plane, and thickly margined, at length convex and submarginate, black, sometimes greenish-suffused; hypothecium yellowish; paraphyses subdiscrete, dark-greenish above; spores ellipsoid-oblong, small, 0,009–12 mm. long, 0,006–8 mm. thick; hymenial gelatine bluish with iodine.—Leight. Lich. Fl. ed. 3, p. 271. *L. sabuletorum* var. *viridans* Flot. in Flora xi. p. 697 (1828).

Exsicc. Leight. n. 331; Larb. Lich. Hb. n. 307.

Flotow points out that the apothecia, when moistened, appear paler and transparent, owing to the pale hypothecium, surrounded by a dark ring.

Hab. On rocks.—*Distr.* Rare in the Channel Islands, Wales and central England.—*B. M.* Between Rozel and Boulay Bay, Jersey; Lyth Hill, Shropshire.

86. **L. asema** Nyl. in Flora lv. p. 356 (1872).—Thallus effuse, thin, unequal, somewhat scattered, whitish (K−, CaCl−). Apothecia small, plane, often subplicate, thinly margined, black or livid-black; hypothecium reddish or reddish-brown; paraphyses concrete; epithecium glaucescent; spores ellipsoid 0,013–16 mm. long, 0,006–8 mm. thick; hymenial gelatine bluish then tawny-wine-coloured with iodine.—Cromb. in Journ. Bot. xi. p. 134 (1873); Leight. Lich. Fl. ed. 3, p. 275.

Closely allied to *L. sublatypea*, but differs in the form of the apothecia, the colours of the hypothecium and epithecium, the larger spores and the reaction of the hymenial gelatine.

Hab. On arenaceous and schistose rocks in maritime districts.—*Distr.* Found only very sparingly in the Channel Islands and the S.W. Highlands of Scotland.—*B. M.* Barcaldine, Argyll.

87. **L. leucophæa** Nyl. in Flora liii. p. 35 (1870).—Thallus indeterminate, thinnish, verrucose-areolate, the areolæ more or less convex, greyish (K−, CaCl−); hypothallus black. Apothecia small, adnate or appressed, plane and thinly margined, reddish-brown, dark-purplish or livid-black, within whitish, the margin often paler, at length excluded; paraphyses brown or dark-brown at the apices; hypothecium pale; spores ellipsoid, 0,009–14 mm. long, 0,004–8 mm. thick; hymenial gelatine pale-bluish, the asci tawny-wine-coloured, with iodine.—*Lecanora leucophæa* Cromb. Lich. Brit. p. 51 (1870); Leight. Lich. Fl. p. 194; ed. 3, p. 178; var. *conglobata* Cromb. in Journ. Bot. xi. p. 134 (1873); Leight. *ll. c.* *Biatora leucophæa* Floerke ex Koerb. Syst. Lich. Germ. p. 194 (1855). *Lecanora leucophæiza* Nyl. in Flora lvii. p. 308 (1874); Leight. Lich. Fl. ed. 3, p. 178.
Exsicc. Cromb. n. 63.

Sometimes the thallus is more massive and scattered, with the apothecia convex, difform and tuberculate; it is then var. *congoblata* Cromb. The apothecia are occasionally crowded together.

Hab. On subalpine rocks.—*Distr.* Plentiful where it occurs in the hilly districts of Wales, N. England, Scotland and W. Ireland.—*B. M.* Near Llyn Aran, Dolgelly, Barmouth and Aran Mawddwy, Merioneth; Snowdon and Carnedd Dafydd, Carnarvonshire; High Force, Teesdale, Yorkshire; Black Lot, Westmoreland; Portlethen, Kincardineshire; Craig Tulloch, Blair Athole, Ben Lawers, Perthshire; Achosragan Hill, Appin, Argyll; Morrone and Craig Guie, Braemar, Aberdeenshire; near Kylemore and near Lough Mask, Connemara, Galway.

88. **L. leucophæoides** Nyl. in Flora liii. p. 35 (1870).—Thallus areolate-granulose, the areolæ smooth, plane or somewhat

rounded, greyish-white (K + yellow, then orange-red); hypothallus black, at times limiting the thallus. Apothecia black, or brownish-black, somewhat plane, becoming immarginate; hypothecium colourless; paraphyses discrete, slender, the epithecium umber-brown; spores ellipsoid or oblong, 0,010–17 mm. long; 0,004–6 mm. thick; hymenial gelatine and asci bluish with iodine. The spermatia are arcuate as in *L. leucophæa*.

Closely allied to the preceding, but differs in the subdeterminate thallus, the more crowded areolæ, the less prominent hypothallus, and in the thalline reaction.

Hab. On rocks in upland districts.—*B. M.* Dolgelly, Merioneth.

89. **L. discolorella** Nyl. in Flora lx. p. 459 (1877).—Thallus effuse, thin, whitish, areolate-rimose or scattered (K + yellow, K (CaCl, + red); hypothallus black. Apothecia black, adnate or appressed, plane, becoming slightly convex and immarginate; hypothecium pale; paraphyses discrete, reddish-brown at the apices; spores ellipsoid, 0,012–16 mm. long, 0,006–7 mm. thick.—Cromb. in Grevillea vii. p. 111. *Lecanora discolorella* Leight. Lich. Fl.; ed. 3, p. 176 (1879).

Somewhat similar to *L. leucophæa*, but the thallus is thin and scanty and light in colour, and the thalline reaction is different. The apothecia are at first sight like those of some species of *Lecanora*, owing to the closely surrounding whitish thallus. The spermatia are arcuate, about 0,020 mm. long and excessively slender.

Hab. On rocks.—*B. M.* Near Penzance, Cornwall (the only locality).

90. **L. viridiatra** Schær. Enum. p. 108 (1850).—Thallus greenish- or dull-yellow, indeterminate, thickish, areolate-diffract, the areolæ plane or convex, subcontiguous or scattered (Kf + yellowish, CaCl −, medulla I −); hypothallus black, distinct. Apothecia small, appressed, plane and thinly margined, at length somewhat convex and immarginate, blackish, hypothecium colourless; paraphyses coherent, dark at the apices; spores ellipsoid, 0,012–15 mm. long, 0,005–6 mm. thick; hymenial gelatine bluish then sordid, the asci wine-reddish, with iodine.—*L. luteoatra* Nyl. in Flora lvi. p. 299 (1873); Cromb. in Journ. Bot. xiii. p. 141 (1875); Leight. Lich. Fl.; ed. 3, p. 293. *Biatora viridiatra* Stenh. Sched. Crit. xiv. p. 8 (1833).

From its general appearance might readily be taken for a *Lecanora* allied to *L. polytropa*. In our specimens, the areolæ are rather scattered, with the hypothallus very visible between them. The apothecia, sparingly present in these, are at times 1-2 innate in each areola.

Hab. On quartzose boulders in a mountainous region.—*B. M.* Morrone, Braemar, Aberdeenshire (the only locality).

91. **L. endomelæna** Leight. in Trans. Linn. Soc. ser. 2, i. p. 239 (1880).—Thallus pale-greyish-green, opaque, granular, the

granules large, scattered or aggregate, convex, composed of minute conglomerate convex roundish or sublobate subfurfuraceous squamules (K + pale-yellow, CaCl + pale yellow). Apothecia violet-black, rather large, innate-sessile, at first plane with a thickish margin, then convex and immarginate, slightly pruinose; hypothecium very thick, brownish-black, with a paler brown stratum below; paraphyses coherent, brown at the apices; spores elongate-cylindrical, small, 0,011–12 mm. long, 0,0045–50 mm. thick.

Hab. On stone walls in upland districts.—*B. M.* Moel-y-gest near Tremadoc (the only locality).

92. **L. ænea** Dufour ex Fr. Lich. Europ. p. 108 (1831); Nyl. in Act. Soc. Linn. Bord. ser. 3, i. p. 380.—Thallus subdeterminate, thickish, rimulose- or verrucose-areolate, shining, tawny or dusky-brown, the areolæ plane or convex (Kf+yellowish, CaCl −, medulla I −); hypothallus black. Apothecia moderate or somewhat large, adnate, at first plane and thinly margined, at length convex and immarginate, brownish-black or black, whitish within; paraphyses concrete, somewhat fuliginous at the apices; hypothecium colourless; spores oblong-ellipsoid, 0,015–18 mm. long, 0,005–7 mm. thick; hymenial gelatine bluish then sordid with iodine.—Cromb. in Journ. Bot. xi. p. 135 (1873); Leight. Lich. Fl. ed. 3, p. 297.

Might be taken, at first sight, for a variety of *Lecanora badia*, as it was regarded by Schærer (*vide* Enum. p. 68). The apothecia in a young state look somewhat lecanoroid; in the British specimens they are numerous, at times somewhat crowded and then angulose. The spermogones, not visible in these, are (*fide* Th. Fries. Lich. Scand. p. 457), long, acicular and arcuate.

Hab. On a mica-schist boulder in a mountainous region.—*B. M.* Morrone, Braemar, Aberdeenshire (the only locality).

93. **L. cyclisca** Malbr. in Bull. Soc. Sci. Nat. Rouen xvii. p. 131 (1881).—Thallus thick, cartilaginous, subdeterminate unequal, glaucous-cinereous-white, furfuraceous. Apothecia minute, blackish-brown, irregularly grouped in small circles, plane, immarginate, reddish when moistened, and then somewhat swollen and convex; hypothecium colourless; paraphyses indistinct, reddish-brown at the apices; spores ellipsoid-oblong, with a thick epispore, rather large, 0,016–18 mm. long, 0,009–10 mm. thick.—*Biatora cyclisca* Massal. Sym. Lich. p. 40 (1855).

Very distinctive on account of the soft thick uneven thallus, which becomes pitted after the disappearance of the apothecia. The single specimen in the British Museum is well fertile.

Hab. On limestone.—*B. M.* Bathampton Downs, Wiltshire.

94. **L. nigroglomerata** Leight. Lich. Fl. p. 252 (1871).—Thallus effuse, subareolate, minutely squamulose, the squamules

smooth and shining, crenulate, glaucous-white, very small, and crowded round the groups of apothecia (K + yellow, CaCl + yellow), hypothallus black, little visible. Apothecia black, large, crowded and deformed, shining, plane or convex, with a thickish slightly paler margin; hypothecium colourless, lateral walls thin, dusky-blackish, often continuous under the hypothecium as a thin dusky line; paraphyses coherent, greenish-black at the apices; spores ellipsoid, 0,011–15 mm. long, 0,006–8 mm. thick; hymenial gelatine bluish then sordid-yellow with iodine.—Cromb. in Journ. Bot. ix. p. 179 (1871). *Lecanora nigro-glomerata* Leight. Lich. Fl. ed. 3, p. 179 (1879).

Exsicc. Cromb. n. 64.

Externally this species has a general resemblance to *L. auriculata* var. *diducens*, but is sufficiently distinguished by the squamulose dispersed thallus, the colourless hypothecium, and the apothecia internally colourless.

Hab. On quartzose stones in bare alpine places.—*B. M.* Summit of Cairn Gowar, Ben-y-gloe, Blair Athole, Perthshire (the only locality).

95. **L. scotinodes** Nyl. in Flora lvi. p. 295 (1873).—Thallus subdeterminate, thinnish, unequal, areolate-rimose, dark-greyish. Apothecia small, convex, immarginate, black, hypothecium colourless; paraphyses moderate, dark-blue at the incrassate apices; epithecium K + pale-violet; spores oblong, simple or occasionally 1–septate, 0,014–18 mm. long, 0,005–6 mm. thick; hymenial gelatine bluish then tawny-wine-coloured or reddish with iodine.—Cromb. in Grevillea ii. p. 90; Leight. Lich. Fl. ed. 3, p. 332.

Allied to *L. scotina*, a plant of Bavaria, but differs in the esquamulose thallus, the convex apothecia, the larger spores and other characters given. The numerous apothecia are occasionally somewhat crowded.

Hab. On schistose rocks in subalpine tracts.—*B. M.* Craig Tulloch, Blair Athole, Perthshire (the only locality).

96. **L. aggregatula** Nyl. in Flora lxvi. p. 101 (1883).—Thallus thickish, indeterminate, minutely granulate, the granules aggregate, grouped in areolæ, whitish or greyish-white (K −, CaCl −). Apothecia small, adnate, plane, subrugulose and at times more or less congregate, opaque, blackish or brownish-black, immarginate or subimmarginate, pale within; epithecium brown; paraphyses slender, somewhat clavate and brown at the apices; hypothecium colourless; spores oblong. 0,011–15 mm. long, 0,005–6 mm. thick; hymenial gelatine bluish then tawny-wine-coloured with iodine.—Cromb. in Grevillea xii. p. 90.

Exsicc. Larb. Lich. Hb. n. 338.

Allied to the preceding, but readily distinguished by the aggregate thallus, which is often overrun by a sterile *Sirosiphon*. The sper-

mogones have the spermatia arcuate, 0,014–18 mm. long, 0,005 mm. thick.

Hab. On boulders in an upland situation.—*B. M.* Charnwood Forest, Leicestershire (the only locality).

97. **L. vitellinaria** Nyl. in Bot. Not. 1852, p. 177.—Thallus absent. Apothecia sessile, minute, concave, at length plane, margined, black, the margin slightly prominent, shining, within greyish-black; paraphyses concrete, greenish-black at the apices; hypothecium thin, brownish; spores elliptical or oblong, 1 or 2-guttulate, 0,010–12 mm. long, 0,006 mm. thick; hymenial gelatine bluish then violet with iodine.—Mudd Man. p. 212, t. 3, f. 77; Cromb. Lich. Brit. p. 78; Leight. Lich. Fl. p. 355; ed. 3, p. 384.

Exsicc. Leight. n. 182.

A singular species, easily recognized by the contrast of colour between the fructification and the host. The apothecia in structure, as observed by Nylander (Lich. Scand. p. 218), are almost those of *L. parasema* or some of its varieties.

Hab. Parasitic on the thallus of *Lecanora vitellina* upon rocks and walls in upland situations.—*Distr.* Only a few localities in W. and N. England and the S. and Central Grampians, Scotland.—*B. M.* Lyth Hill and Haughmond Hill, Shropshire; Malvern, Worcestershire; near Newton and Battersby, Cleveland, Yorkshire; near Lawers Inn and at Blair Athole, Perthshire.

98. **L. fuliginosa** Tayl. in Mackay Fl. Hib. ii. p. 131 (1836).—Thallus dark-brown or reddish, granular-squamulose, conglomerate (K−, CaCl−), hypothallus blackish-brown, byssoid. Apothecia black, small, solitary or aggregate, somewhat convex, with a thin margin which is soon obliterated; hypothecium thick, brownish-black; paraphyses coherent, pale-yellowish-brown, brownish- or bluish-black at the apices; spores ellipsoid, small, 0,008–10 mm. long, 0,004–6 mm. thick; hymenial gelatine, especially the asci, bluish with iodine.—Mudd Man. p. 208; Cromb. Lich. Brit. p. 77; Leight. Lich. Fl. p. 255; ed. 3, p. 47. *L. confusa* Nyl. Lich. Scand. p. 216 (1861).

Exsicc. Leight. n. 305.

At once distinguished by its scattered and friable squamulose thallus, and brownish-black somewhat byssoid hypothallus. According to Th. Fries (Lich. Scand. p. 421) the hypothallus is a species of *Sirosiphon*, which grows intermixed with this lichen.

Hab. On siliceous rocks.—*Distr.* In mountainous districts throughout the British Islands.—*B. M.* Barmouth, Merioneth; Llanbedrog and Llyn Geirionydd, Carnarvon: Glen Fender, Blair Athole, Perthshire; Dunmanway, Cork; Glengaaft, Carig Mt., Kerry; Doughruagh Mt., Connemara, Galway.

Var. **subconfusa** A. L. Sm.—Differs from the type in the somewhat darker more finely granular thallus, in the small innate apothecia, and the rather smaller spores, 0,007–8 mm. long, and

0,0035 mm. thick. The thallus is intermixed with *Sirosiphon* and *Pyrenopsis* sp.—*L. subconfusa* Nyl. in Flora lii. p. 84 (1869); Cromb. in Grevillea v. p. 27; Leight. Lich. Fl. ed. 3, p. 332.

Hab. On siliceous rocks.— *B. M.* Tullywhee Bridge, near Kylemore, Connemara, Galway.

99. **L. arctica** Sommerf. Suppl. Fl. Lapp. p. 156 (1826).—Thallus effuse, composed of minute, subglobose, papillose granules, crowded or subdiscrete, whitish or brownish-grey (Kf + yellow, medulla, CaCl + orange-red). Apothecia small, black, bluish-pruinose or naked, convex, immarginate; hypothecium pale-brownish; paraphyses indistinct, sordid-greenish-black towards the apices; spores oblong or ellipsoid, 0,013–18 mm. long, 0,006–8 mm. thick; hymenial gelatine slightly blue with iodine. —Mudd Man. p. 200; Cromb. Lich. Brit. p. 79; Leight. Lich. Fl. p. 273; ed. 3, p. 274.

A high alpine species with an entirely northern distribution.

Hab. On mosses in alpine districts.—*Distr.* On the high altitudes of the Scottish Grampians.—*B. M.* Ben Lawers, Ben Vrackie and Craig Calliach, Killin, Perthshire; Ben Macdhui and Lochnagar, Braemar, Aberdeenshire.

100. **L. limosa** Ach. Lich. Univ. p. 182 (1810).—Thallus effuse, thin, furfuraceous, whitish-grey (K−, CaCl−). Apothecia black, adnate, convex or subglobose, immarginate; hypothecium colourless or pale-brownish; paraphyses thickish, coherent, usually bluish-green at the apices; spores ellipsoid, fusiform-ellipsoid or oblong, 0,009–18 mm. long, 0,004–6 mm. thick; hymenial gelatine blue then sordid-wine-red or yellowish with iodine.—Carroll in Journ. Bot. iv. p. 24 (1866); Cromb. Lich. Brit. p. 79; Leight. Lich. Fl. p. 258; ed. 3, p. 252. *L. Wulfenii* Mudd Man. p. 200 pro parte (non Hepp. *fide* Carroll).

Exsicc. Cromb. Lich. Brit. n. 90.

This species is nearly allied to the next, but the thallus is less granular and the spores are shorter.

Hab. On the earth in mountainous districts.—*Distr.* Local and rare on the higher Scottish hills.—*B. M.* Canlochan, Forfarshire; Ben Lawers and Ben-y-gloe, Blair Athole, Perthshire; Ben Cruachan, Argyll; Ben-naboord and Lochnagar, Braemar, Aberdeenshire.

101. **L. alpestris** Sommerf. in K. Norske Vidensk. Skrift. ii. p. 54 (1824–7).—Thallus effuse, thin, granular or minutely warted-areolate, whitish or greyish on a whitish hypothallus (Kf + yellow, CaCl −). Apothecia appressed convex, immarginate, subconglomerate, black; hypothecium colourless or pale-brownish; paraphyses coherent, dark brownish-blue-green at the apices; spores elongate-ellipsoid or oblong, 0,014–25 mm. long, 0,003–4 mm. thick; hymenial gelatine blue then tawny-yellowish

with iodine.—Carroll in Journ. Bot. iv. p. 24 (1866); Cromb. Lich. Brit. p. 79; Leight. Lich. Fl. ed. 3, p. 272.

Has been confused with the continental species *L. Wulfenii*, which has a whitish tartareous thallus and spreads over mosses in alpine situations.

Hab. On the earth in alpine places.—*Distr.* Rare, found only on the summits of the highest hills in Scotland.—*B. M.* Ben Lawers, Perthshire.

102. **L. subfurva** Nyl. in Flora lii. p. 360 (1872).—Thallus indeterminate, thinnish or submoderate, areolate-diffract, above minutely furfuraceous and opaque, brownish-black or greyish-brown (K −, CaCl −); hypothallus black, little visible. Apothecia small, plane, wrinkled, opaque, often angulose, margined, black, the margin thin, persistent; paraphyses slender, irregularly coherent; epithecium and hypothecium dark (K −); spores subglubose, ellipsoid, 0,011–12 mm. long, 0,009 mm. thick; hymenial gelatine deep-blue with iodine.—Cromb. in Grevillea i. p. 61: Leight. Lich. Fl. ed. 3, p. 250.

Viewed superficially might readily be taken for a species allied to *L. furvella*. The analytical characters, however, of the fructification show that it belongs to this section near *L. inferior* Nyl. a Lapland plant. The thallus spreads extensively over the substratum, and is fertile only towards the centres—the apothecia being usually somewhat scattered.

Hab.—On micaceous rocks and walls in upland situations.—*Distr.* Very local, though plentiful, where it occurs among the Central Grampians, Scotland.—*B. M.* Craig Tulloch and Glen Fender, Blair Athole; also by Loch Earn and Ben Lawers, Perthshire.

103. **L. deparcula** Nyl. in Flora lv. p. 361 (1872).—Thallus determinate, scattered, thin, subareolate, at times nearly evanescent, greyish (K −, CaCl −); hypothallus blackish, only here and there visible. Apothecia small, slightly prominent, somewhat difform, subumbonate in the centre, marginate, black, concolorous within, the margin obtusely turgid, at times subcrenate; paraphyses nearly moderate, bluish-green towards the apices; epithecium dark-bluish; hypothecium brownish-black; spores ellipsoid, 0,009–12 mm. long, 0,005–7 mm. thick; hymenial gelatine deep-blue then dark with iodine.—Cromb. in Grevillea i. p. 62; Leight. Lich. Fl. ed. 3, p. 311.

A rather inconspicuous plant. The gonidia, as noted by Nylander, are subglobose, 0,004–12 mm. in diameter. The specimens gathered are for the most part sterile.

Hab. On calcareous stones in alpine localities.—*Distr.* Extremely local; rare on the Grampians, Scotland.—*B. M.* Summit of Ben-y-gloe, Blair Athole, Perthshire; Morrone, Braemar, Aberdeenshire.

104. **L. dealbatula** Nyl. in Flora lvii. p. 315 (1874).—Thallus subdeterminate, thin, rimose or subareolate, white (K −,

CaCl−). Apothecia small, somewhat prominent, thinly margined, umbonate or at length subgyrose in the centre, black, concolorous within; epithecium (in thin section) brown; hypothecium dark-brown; paraphyses moderate, coherent; spores ellipsoid, 0,010–12 mm. long, 0,006–8 mm. thick; hymenial gelatine deep-blue with iodine.—Cromb. in Grevillea iii. p. 23; Leight. Lich. Fl. ed. 3, p. 287.

In the specimens seen the apothecia are rather scattered and not very numerous.

Hab.—On schistose rocks in upland tracts of mountainous regions. —*Distr.* Sparingly in N. Wales, the S. Grampians, Scotland, and N.W. Ireland.—*B. M.* Cader Idris, Merioneth; Trefriw, Denbighshire; Stronachlan, Ben Lawers, Killin, and Loch-na-gat, Perthshire; Doughruagh Mt., Galway.

105. **L. tabidula** Nyl. in Flora lxii. p. 357 (1879).—Thallus effuse, scattered, thin, or very thin, unequal, blackish (K−, CaCl−). Apothecia minute, plane, slightly margined, often aggregate, black, concolorous within; paraphyses not very well discrete; epithecium sordid-bluish-black; hypothecium and perithecium dark-brown (or reddish-brown in thin section); spores ellipsoid, 0,011–16 mm. long, 0,006–7 mm. thick; hymenial gelatine bluish then tawny-wine-coloured with iodine.—Cromb. in Grevillea viii. p. 112.

The thallus, but little visible, appears only in the immediate vicinity of the fructification which generally occurs in small, scattered groups. Very near *L. deparcula*, but differs in the thallus, the paraphyses, and the reaction of the hymenial gelatine. Spermogones are here and there present with slightly arcuate spermatia, 0,012–14 mm. long, 0,0005 mm. thick, though, as Nylander conjectures, these may be foreign, faint traces of another thallus being occasionally visible in the chinks of the substratum.

Hab. On quartzose stones in an alpine situation.—*B. M.* Summit of Ben-y-gloe, Blair Athole, Perthshire (the only locality).

106. **L. jurana** Schær. Enum. p. 123 (1850).—Thallus effuse, thin, continuous, subrimulose or scattered, whitish, often almost obsolete (K−, CaCl−). Apothecia adnate, somewhat large and scattered, at first concave then plane with thickish prominent flexuose margin, often irregular and 2–3 connate, black, naked, concolorous within; paraphyses subcoherent; hypothecium and epithecium blackish; spores ellipsoid, 0,016–18 mm. long, 0,010–11 mm. thick; hymenial gelatine deep-blue with iodine.—Leight. in Ann. Mag. Nat. Hist. ser. 4, iv. p. 199 (1869); Lich. Fl. p. 299; ed. 3, p. 310.

In the British specimens the thallus is either rather scattered (form *dispersa* Arnold in Flora li. p. 35 (1868)), or more commonly scarcely visible. The apothecia are rather variable, being frequently, as Schærer says, minute and several aggregate with a common exciple.

This, as in other cases, is owing to the growth of young fruit upon the old.

Hab. On calcareous rocks in hilly and mountainous districts.—*Distr.* Seen from only a few localities in W. and Central England, N. Wales and the Grampians, Scotland.—*B. M.* Bathampton Downs, Somerset; Black Dale, near Buxton, Derbyshire; Lyn Cae, Cader Idris, Merioneth; Cunswick Scar, Westmoreland; Achosragan Hill, Appin, Argyll; Craig Tulloch, Blair Athole, Perthshire; Morrone, Braemar, Aberdeenshire.

107. **L. subumbonella** Lamy in Bull. Soc. Bot. Fr. xxx. p. 409 (1883).—Thallus effuse, thinnish, unequal, white, subopaque (K —, CaCl —). Apothecia minute or subminute, somewhat plane, margined, umbonate in the centre, black, opaque, concolorous within; paraphyses subcoherent, pale-brown at the apices; hypothecium thickish, brown; spores oblong-ellipsoid, 0,016–22 mm. long, 0,007–9 mm. thick; hymenial gelatine bluish, the asci at length tawny-wine-red, with iodine.—*L. subumbonata* Nyl. in Flora lix. p. 236 (1876), non in Flora lv. p. 358 (1872); Cromb. in Grevillea v. p. 28; Leight. Lich. Fl. ed. 3, p. 306.

The apothecia, frequent in the single specimen seen, often appear as if divided into several hymenia. The spermogones, sparingly present, have the spermatia cylindrical, or fusiform-cylindrical, 0,004–7 mm. long, 0,0008 mm. thick.

Hab. On mica-schist rocks in an upland situation.—*B. M.* Near Letterfrack, Connemara, Galway (the only locality).

108. **L. contortula** Stirton in Scott.Nat. iv. p. 167 (1877).—Thallus pale or leaden-grey, thickish, somewhat wrinkled, rimose-areolate (K—, CaCl—). Apothecia black, adnate, rather large, plane or somewhat convex, umbonate or gyrose-plicate, with a thick margin; hypothecium brownish-black, brownish upwards, paraphyses distinct, brown at the apices; spores oblong or fusiform oblong, 0,015–21 mm. long, 0,006–75 mm. broad, hymenial gelatine blue then wine-red with iodine.—Leight. Lich. Fl. ed. 3, p. 307. Specimen not seen.

Stirton remarks that this species is nearly allied, if not identical, with *L. subumbonata*, but the larger apothecia and spores seem to make it distinct.

Hab. On rocks. Collected by Dr. Stirton near Salen, in Mull. A specimen in the British Museum, collected by W. Johnson at Bywell, Northumberland, and labelled by him *L. contortula*, has no visible thallus, and the apothecia are not gyrose; but the spores and other characters agree with the description given.

109. **L. consentiens** Nyl. in Flora xlix. p. 371 (1866).—Thallus whitish, smooth, subdeterminate, cracked-areolate, the areolæ plane or slightly convex (K—, CaCl—), occasionally with pale- or reddish-brown cephalodia (superficial granules enclosing blue-green algæ). Apothecia black or brownish-black, innate, con-

cave or at length plane, obtusely margined; hypothecium thin, blackish-brown; paraphyses slender, discrete, dark-brown at the apices; spores ellipsoid or ellipsoid-oblong, large, 0,027–38 mm. long, 0,016–22 mm. thick; hymenial gelatine bluish then tawny-wine-red with iodine.—Carroll in Journ. Bot. v. p. 255 (1867); Cromb. Lich. Brit. p. 80; Leight. Lich. Fl. p. 296; ed. 3, p. 305. *L. scutulata* Stirton in Grevillea iii. p. 34 (1874); Cromb. in Grevillea iii. p. 143 (1875).

Closely allied to the following species, from which it differs in the more contiguous, at times subrugose thallus and in the more concave, immersed apothecia. In the original specimen cephalodia are absent as is usually the case in Britain.

Hab. On schistose rocks in mountainous regions.—*Distr.* Only sparingly in N. Wales and on the S. Grampians, Scotland.—*B. M.* Cader Idris, Merioneth; Snowdon, Carnarvon; Craig Calliach, above Loch-na-Gat, and near the summit of Ben Lawers, Perthshire.

Form **circumcissa** Nyl. ex Cromb. in Journ. Bot. xx. p. 275 (1882).—Thallus pinkish-white; apothecia somewhat small, immarginate, circumciss-lecanoroid; otherwise as in the type.

From the apothecia having apparently a thalline margin, this might readily be taken for a *Lecanora* of the section of *L. cinerea*. The cephalodia in the few specimens gathered are not unfrequent.

Hab. On schistose rocks in mountainous regions.—*Distr.* Extremely local and scarce in N. Wales and on one of the S. Grampians, Scotland.—*B. M.* Snowdon, Carnarvonshire; Craig Calliach, Perthshire.

110. **L. panæola** Ach. in Vet. Ak. Handl. xxix. p. 267 (1808) & Lich. Univ. p. 201.—Thallus determinate, areolate-granulose, thinnish or somewhat thick, greyish-white, whitish or cream-coloured, the areolæ tumid, rimose-diffract, smooth (Kf + yellowish, CaCl f + reddish, K (CaCl) + deep red), cephalodiferous, the cephalodia tuberculate, reddish; hypothallus dark-brown. Apothecia small or moderate, appressed or immersed, at first concave, then plane, at length convex, black or brownish-black, pruinose or denudate, the margin thickish at length excluded; paraphyses slender, brown or dark-brown at the apices; hypothecium thick, blackish; spores ellipsoid or ovoid, 0,017–27 mm. long, 0,008–12 thick, often with a halo and then 0,027–30 mm. long, 0,018–20 mm. thick; hymenial gelatine deep-blue with iodine.—Carroll in Journ. Bot. v. p. 255 (1867); Leight. in Ann. Mag. Nat. Hist. ser. 4, iv. p. 199 (1869); Cromb. Lich. Brit. p. 80; Leight. Lich. Fl. p. 280; ed. 3, p. 284. *L. cechumena* Tayl. in Mackay Fl. Hib. ii. p. 117 (1836) (non Ach.). *Lichen athrocarpus* Sm. Engl. Bot. t. 1829 (1808) (non Ach.). *Aspicilia athrocarpa* Mudd Man. p. 16 (1861).

Exsicc. Leight. n. 384; Larb. Lich. Hb. n. 142.

This and the preceding are well characterized by the thallus being variegated by more or less frequent cephalodia intermixed with the areolæ. The thallus varies in thickness, being at times very thin and

plane (form *obliterata* Leight. Lich. Fl. ed. 3, p. 285), probably from being denuded by water, and also in colour, which is rarely somewhat leaden-coloured, evidently owing to maceration from a sterile crustaceous lichen with which it is associated. In its fully developed condition, and with pruinose apothecia, it is var. *β elegans* Th. Fr. in Nov. Act. Reg. Soc. Upsal. p. 307 (1861); this form occurs rarely on the Scottish mountains. The apothecia, common in the British specimens, are at times somewhat crowded and then more or less angulose. When young, they are concave and immersed in the areolæ with, as it were, a spurious thalline margin (form *subconsentiens* Leight. Lich. Fl. ed. 3, p. 284).

Hab. On rocks and stones, granitic and schistose, rarely arenaceous, in mountainous regions.—*Distr.* Rare in the North of England, more frequent in Wales and Ireland, and in the central counties of Scotland.—*B. M.* Cader Idris and Corwen, Merioneth; Snowdon, Carnedd Dafydd, Glyder Mts., Trefriw and Llyn Ogwen, Carnarvon; Abden Burf, Shropshire; Teesdale, Durham; Ravensborrow Crag, Kent River Valley, Westmoreland; West Water, Fife; Ben Lawers, Craig Calliach, Crianlarich, and Glen Falloch, Perthshire; Canlochan, Forfarshire; Barcaldine, Lorne, and Ben Cruachan, Argyll; Glen Callater and Craig Guie, Braemar, Aberdeenshire; Glen Nevis, Lochaber, and Invermoriston, Invernessshire; Cuchullin Hills, Isle of Skye; Applecross, Ross; Loch Shin, Sutherland; Brandon Mt. and Mangerton, Kerry; Kylemore, Doughruagh Mt., Connemara; Ballynakill, Galway.

111. **L. corollidia** Stirton in Trans. Glasgow Soc. Nat. 1875, p. 88.—Thallus pale or pallid-ashy-grey, somewhat thick, diffract-areolate, rather plane (K + yellow then red). Apothecia black, adnate, large, plane, rugose, sometimes bluish-grey-pruinose with a flexuose obtuse margin; hypothecium thick, dark-brownish-black; paraphyses indistinct, brown at the apices; spores ellipsoid, 0,015–20 mm. long, 0,008–11 mm. thick.—Leight. Lich. Fl. ed. 3, p. 296. Specimen not seen.

"Perhaps a form of *L. Mooreana*" (Stirton, *l. c.*). This species seems from the description to be very nearly identical with *L. panæola*, of which, except for the absence of cephalodia, it might be only a growth form.

Hab. On rocks. Collected by Dr. Stirton at Thurso, Caithness.

112. **L. phæenterodes** Nyl. in Flora lviii. p. 363 (1875).—Thallus yellowish-white, firm, areolate. Apothecia plane, marginate, varying in size, scattered or crowded, the margin persistent, flexuose, disc bluish-grey, pruinose or naked; hypothecium dark-reddish, brownish above; paraphyses slender, yellowish at the tips; spores ellipsoid, 0,014–22 mm. long, 0,008–12 mm. thick; hymenial gelatine persistent, deep-blue with iodine.

In the single specimen in the British Museum, collected and determined by Crombie, the thalline areolæ are somewhat scanty and scattered; the apothecia are sometimes proliferous, minute fruits being borne on the disc of older forms.

Hab. On rocks in alpine situations.—*B. M.* Ben Lawers, Perthshire (the only locality).

113. **L. contigua** Fr. Lich. Eur. p. 298 (1831) pro parte.—Thallus greyish-white or sometimes ashy-grey, usually rather thin, continuous, finely cracked granular or areolate, the areolæ continuous and flat or sometimes convex and somewhat tumid (K—, CaCl—); hypothallus black. Apothecia seated on the thallus, varying in size, plane or convex, somewhat rough, the margin thick, obtuse, prominent, or sometimes almost obliterated; hypothecium thick, blackish-brown; paraphyses slender, subcoherent, dark- or olivaceous-brown at the apices; spores ellipsoid, large, 0,016–27 mm. long, 0,008–13 mm. thick; hymenial gelatine blue then wine-red with iodine.—Mudd Man. p. 209 (excl. syn.; spore measurements too small); Cromb. Lich. Brit. p. 80 (excl. vars. *crustulata* and *speirea*); Leight. Lich. Fl. p. 292; ed. 3, p. 299 (excl. forms *meiospora* and *aggerata*). *Verrucaria contigua* Hoffm. Deutschl. Fl. ii. p. 184 (1795).

The thallus and apothecia of this lichen vary considerably in appearance, giving rise to a large number of varieties which have been described by Leighton as forms. They are all distinguished by the characters of the apothecium, its thick dark-coloured hypothecium and somewhat large ellipsoid spores. When the thallus is limited and intersected by the hypothallus, it is f. *limitata* Leight. (Lich. Fl. p. 292; ed. 3, p. 299); when it occurs in round somewhat furfuraceous patches with rather small apothecia, it is f. *leprosa* Leight. (*l. c.* p. 293). Another series of forms have a thick well-developed thallus and occasionally very large apothecia; var. *nobilis* Fr. (*l. c.* p. 301, f. *nobilis* Leight. *l. c.* p. 293) is characterized by having the thallus thick, tartareous, areolate and turgid; while f. *Hoffmanni* Leight. (*l. c.*) is lighter in colour and less turgid with larger apothecia. In var. *notabilis* Nyl. (in Not. Sällsk. Faun. & Fl. Fenn n. ser. i. p. 241 (1859)), (f. *notabilis* Leight. *l. c.* ed. 3, p. 302), the thallus is whitish and unequally minutely granulose, the granules dispersed or sometimes in small clusters (acervulate), resembling the thallus of *Stereocaulon condensatum*. Leighton describes a further evidently rare form as f. *pustulata* (*l. c.* p. 302), which is yellowish-grey, limited by the black hypothallus, and areolate, the areolæ plane with central sorediate protuberances; some of these are enlarged into orbicular, rather flat tubercles, in which are embedded a conglomeration of minute marginate black apothecia.

Hab. On rocks in maritime or hilly regions.—*Distr.* Common throughout Great Britain and Ireland.—*B. M.* Endellion, Cornwall (f. *limitata*); Crown, East Down, Dartmoor, Devon; Leith Hill, Surrey; Charnwood Forest, Leicester; near Malvern, Worcester; Caercaradoc, Haughmond Hill (f. *leprosa*), and near Ludlow, Shropshire; near Monmouth; Aran Mawddwy, Llyn Aran, Cader Idris, and Dolgelly, Merioneth; Carnedd Dafydd, Nant Ffrancon and Capel Curig, Carnarvon; Roughton, Lincoln; Ayton, Cleveland, Yorkshire; Westwater, Forfar; Loch-na-gat, Ben Lawers, Killin, Glen Lochay, Craig Calliach, and Ben-y-gloe, Perthshire; Barcaldine, Lorne, Achosragan Hill, Appin and Island of Lismore, Argyll; Morrone, Braemar, Aberdeenshire.

Form **calcarea** Leight. Lich. Fl. p. 292 (1871).—Thallus creamy-white, tartareous, smooth, areolate, the areolæ plane or

slightly convex, contiguous. Apothecia appressed, becoming superficial, plane or slightly convex.—*L. contigua* var. *calcarea* Fr. Lich. Eur. p. 302 (1831) (excl. syn); Leight. op. cit. ed. 3, p. 300.

A well-marked form with white rather shining smooth thallus.

Hab. On rocks.—*Distr.* Not unfrequent in England, Wales and W. Ireland; not recorded from Scotland.—*B. M.* St. Minver and St. Wenn, Cornwall; Okehampton, Devon; Beddgelert, Carnarvon; Kylemore, Connemara, Galway.

Var. **percontigua** A. L. Sm.—Distinguished by the rather larger, umbonate apothecia, and the different chemical reaction (K + yellowish and then brownish-red).—*L. percontigua* Nyl. in Flora lxv. p. 457 (1882).

Hab. On rocks, rare.—*B. M.* Barrowmouth, Whitehaven, Cumberland (the only locality).

Var. **platycarpa** Fr. Lich. Eur. p. 300 (1831).—Thallus diffuse, whitish or greyish, thin or at length disappearing. Apothecia moderate in size or large, at first plane with a tumid prominent margin, becoming immarginate, sometimes appressed-adnate.—Mudd Man. p. 210; Cromb. Lich. Brit. p. 80; Leight. Lich. Fl. p. 292; ed. 3, p. 299. *L. platycarpa* Ach. Lich. Univ. p. 173 (1810); var. *steriza* Floerke ex Koerb. Syst. Lich. Germ. 249 (1856); f. *steriza* Mudd *l. c.*; var. *hydrophila* Fr. *l. c.* p. 301; f. *hydrophila* Leight. Lich. Fl. p. 293 (1871); ed. 3, p. 300. *Patellaria macrocarpa* Dc. Fl. Fr. ii. p. 347 (1805).

Exsicc. Mudd n. 109.

Distinguished from the type by the very scanty thallus.

Hab. On rocks. Not unfrequent in the hilly regions of N. England, Wales, Scotland and Ireland.—*B. M.* Nant Ffrancon and Beddgelert, Carnarvon; Ayton Moor, Cleveland, Yorkshire; Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire; Doughruagh Mt., Connemara, Galway.

Var. **flavicunda** Nyl. Lich. Scand. p. 224 (1861).—Thallus rusty-red, rather thick, tartareous, areolate, the areolæ flat and smooth. Apothecia moderate in size or large, flat or somewhat convex, more or less whitish-pruinose.—Cromb. Lich. Brit. p. 80; f. *flavicunda* Leight. Lich. Fl. p. 294; ed. 3, p. 301. *L. flavicunda* Ach. Lich. Univ. p. 166 (1810).

Hab. On rocks.—*Distr.* Not unfrequent in maritime and hilly districts of S.W. and N. England, Wales and Scotland.—*B. M.* Carn Galven, near Penzance, Cornwall; Clee Hill, Shropshire; Cader Idris, Merioneth; Snowdon, Carnarvon; Ayton Moor, Cleveland, Yorkshire; Teesdale, Durham; Ben Beck, Sidlaw Hills, and Baldoran, Forfarshire; Ben Lawers, Perthshire; Craig Coinnoch and Morrone, Braemar, Aberdeenshire; Dunkerron, Kerry; Connemara, Galway; Errif River, Mayo.

114. **L. sorediza** Nyl. in Bull. Soc. Linn. Norm. ser. 2, vi. p. 292 (1872).—Thallus determinate, smooth, areolate-

rimulose, crowdedly sorediose, greyish; the soredia thin, plane, rotundate (K−, CaCl−, medulla I + bluish); hypothallus blackish. Apothecia large or submoderate, plane, margined, black, bluish-grey-pruinose; paraphyses moderate or thickish; epithecium brownish; hypothecium brownish-black; spores fusiform-ellipsoid, 0,015–22 mm. long, 0,007–9 mm. thick; hymenial gelatine, as also the asci, bluish with iodine.—Cromb. in Journ. Bot. xiii. p. 141 (1875); Leight. Lich. Fl. ed. 3, p. 305.

Exsicc. Mudd n. 181; Johns. n. 349.

Differs from *L. contigua* in the peculiar soredia, the thicker paraphyses, and the reactions with iodine. The hypothallus limits the thallus and is occasionally elsewhere visible. In the few British specimens the apothecia are usually somewhat scattered. The spermogones have the spermatia straight, 0,006–8 mm. long (*fide* Nyl. Pyr. Or. Obs. Nov. p. 63 (1891)).

Hab. On rocks, gneissic and schistose, in upland hilly situations.—*Distr.* Only a few localities in W. and N. England, N. Wales, and the S. Grampians, Scotland.—*B. M.* Malvern Hills, Worcestershire; Dolgelly, Merioneth; Langbaurghrigg, Cleveland, Yorkshire; The Trossachs, Perthshire.

Form **depauperata** Cromb. MS.—Thallus thin, nearly esorediose, greyish or glaucous-white, the areolæ dispersed; hypothallus predominating.

Probably only a less developed state with a few very small soredia here and there visible. The apothecia are but little pruinose. It seems to connect the type with form *esorediza* Nyl. ex Lamy in Bull. Soc. Bot. Fr. xxv. p. 450 (1878).

Hab. On calcareous rocks in a mountainous district.—*B. M.* Twelve Pins, Connemara, Galway (the only locality).

115. **L. tenebrans** Nyl. in Flora lix. p. 309 (1876).—Thallus determinate, continuous, rimulose, leaden-greyish or dark-leaden-coloured (K −, CaCl −, medulla partly I + bluish); hypothallus black. Apothecia moderate in size, plane and thinly margined, then convex and immarginate, black, concolorous within; paraphyses slender, dark at the apices; hypothecium thick, black; spores ellipsoid, 0,018–24 mm. long, 0,010–13 mm. thick; hymenial gelatine and asci persistently deep-blue with iodine.—Cromb. in Grevillea v. p. 28; Leight. Lich. Fl. ed. 3, p. 303.

Perhaps, as Nylander says, only a subspecies of *L. contigua*, differing chiefly in the colour of the thallus and the reaction of the hymenial gelatine. In the two specimens seen the apothecia are here and there several confluent.

Hab. On schistose rocks in a mountainous region.—*B. M.* Summit of Doughruagh Mt., Connemara, Galway (the only locality).

116. **L. albocœrulescens** Ach. Meth. p. 52 (1803).—Thallus subdeterminate, thickish, smooth, continuous or at length cracked, opaque, whitish or glaucous (K −, CaCl −); hypothallus blackish. Apothecia moderate in size, appressed, plane, black,

bluish-grey-pruinose, the margin prominent, thinnish, naked, entire; hypothecium thick, brownish-black; paraphyses slender, coherent, dark at the apices; epithecium granulose; spores oblong or ellipsoid, 0,020–28 mm. long, 0,007–10 mm. thick; hymenial gelatine deep-blue, asci wine-reddish, with iodine.—S. F. Gray Nat. Arr. I. p. 467 pro parte; Hook. Fl. Scot. ii. p. 38; Mudd Man. p. 211; Leight. Lich. Fl. p. 295 pro parte; ed. 3, p. 303. *L. contigua* var. *albocœrulescens* Nyl. Lich. Scand. p. 224; Cromb. Lich. Brit. p. 80. *Lichen albocœrulescens* Wulfen in Jacq. Coll. ii. p. 184, t. 15, f. 1 (1788).

The apothecia are numerous and at times more or less confluent, with the margin subflexuose. In old plants the bloom almost disappears.

Hab. On rocks and stones of walls in maritime and upland districts. —*Distr.* Seen from only a few localities in Great Britain and in N.W. Ireland.—*B. M.* Withiel, Cornwall; Dartmouth, Devon; Leith Hill, Surrey; Stormy Down, Glamorganshire; Llandyssil, Cardiganshire; Langbaurghrigg, Cleveland, Yorkshire; Stavely Head, Westmoreland; Achosragan Hill, Appin, Argyll; near Achmore, Killin, Perthshire; Slegachan, Isle of Skye; near Tully, Galway.

Var. *β* **alpina** Schær. Spicil. ii. (1828), p. 143.—Thallus thickish. Apothecia somewhat large, prominent, plane or convex, the margin more or less flexuose.—Mudd Man. p. 211; Leight. Lich. Fl. ed. 3, p. 303.

Characterized by the thicker thallus and the margin of the larger apothecia, which are occasionally 2–3 aggregate, when the margin is less distinct.

Hab. On damp rocks, granitic and schistose, in maritime and mountainous districts.—*Distr.* Seen from only a few localities in Great Britain, Ireland and the Channel Islands.—*B. M.* Island of Sark; St. Mervyn, Cornwall; Aberedw, Radnorshire; Cader Idris, Merioneth; Langbaurghrigg, Cleveland, Yorkshire; Achosragan Hill, Appin, Argyll; Glen Dee, Braemar, Aberdeenshire; Moher, Clare.

117. **L. crustulata** Koerb. Syst. Lich. p. 249 (1855).—Thallus effuse, very thin, leprose-tartareous, subrimulose or slightly verruculose, greyish-white or brownish (K−, CaCl−); hypothallus black, scarcely visible. Apothecia small, sessile, plane, black, margined, the margin entire; paraphyses concrete, brownish or blackish at the apices; hypothecium thick, blackish; spores oblong, 0,014–18 mm. long, 0,006–8 mm thick; hymenial gelatine bluish then sordid, asci wine-red, with iodine.—Mudd Man. p. 209 (excl. var. *β*); Leight. Lich. Fl. p. 257; ed. 3, p. 249. *L. parasema* var. *θ crustulata* Ach. Lich. Univ. (1810) p. 176. *L. contigua* var. *crustulata* Cromb. Lich. Brit. p. 80.

Exsicc. Mudd n. 177; Leight. n. 333.

Approaches some forms of *L. contigua*, but is well differentiated by the thin leprose thallus and the smaller apothecia and spores.

Two forms are distinguished: var. *fuscella* Mudd (Man. p. 209 (1861)) with a thin brown thallus looking like a dark stain on the sandstone, and f. *geographica* Cromb. MS. which is limited and intersected by the black hypothallus.

Hab. On arenaceous rocks and flints, very rarely lignicolous, in maritime and upland situations.—*Distr.* Only a few localities in England and Ireland; not seen from Scotland.—*B. M.* Lydd Beach, Kent (f. *geographica*); Shiere, Surrey; Launceston, Cornwall; The Downs, Lewes, near Hastings, Patcham, and Newhaven, Sussex; Lyndhurst Moor, Hants; Oaksey, Wiltshire; Hale's End, Malvern, Worcestershire; Larch Bank, near Ayton, Cleveland, Yorkshire; Ballinhassig, near Cork; Kylemore, Galway.

Var. **meiospora** Olivier Exp. Syst. ii. p. 113 (1901).—Thallus whitish-grey, areolate or scattered, thicker than in the type. Apothecia often arranged in lines, black, plane, marginate, larger than in the type; spores oblong-elliptical, 0,012–16 mm. long, 0,006–7 mm. thick.—*L. contigua* var. *meiospora* Nyl. Lich. Scand. p. 125 (1861); Leight. Lich. Fl. ed. 3, p. 302.

Exsicc. Larb. Lich. Hb. n. 310.

Hab. On arenaceous and calcareous rocks in upland situations.—*Distr.* Only a few localities in central England, Scotland, and Ireland.—*B. M.* Bradgate Park, Leicestershire; Wellingdale Doe, Suffolk; Crianlarich, Perthshire; Doughruagh Mt., Connemara, Galway.

118. **L. sympathetica** Tayl. ex Leight. Lich. Fl. p. 257 (1871).—Thallus pale-brown or creamy-white, subdeterminate, tartareous, plane, rimose-areolate, furfuraceous. Apothecia black, numerous, small, subinnate rugose, the margin indistinct, rugose; hypothecium thick, black or brownish-black; paraphyses indistinct; the epithecium brown; spores ellipsoid, 0,011 mm. long, 0,006 mm. thick.—Leight. op. cit. ed. 3, p. 249.

Leighton gives the thalline reactions as K + yellow, CaCl + yellow, but when the test was applied to the type at Kew, there was no colour produced. It differs from *L. crustulata* in the more developed tartareous thallus, in the apothecia which are innate at first, and in the smaller spores.

Hab. On sandstone.—*Distr.* Found in England, Wales, and Ireland.

119. **L. prominula** Borr. in Engl. Bot. Suppl. 2687, fig. 1a (1831).—Thallus pale-tawny-brown, thin, minutely granular (K + yellow, CaCl + yellow). Apothecia black, small, numerous, crowded, sessile plane, with an obtuse entire margin; hypothecium colourless or yellowish-brown, the lateral excipulum blackish-brown; paraphyses rather lax, pale, dark-brown at the apices; spores elliptic-oblong, 0,011–15 mm. long, 0,006–9 mm. thick; hymenial gelatine blue then dirty-violet with iodine.—Hook. in Sm. Engl. Fl. v. p. 175; Mudd Man. p. 203 (spore measurements too small); Leight. Lich. Fl. p. 259, ed. 3, p. 255.

Scarcely to be distinguished outwardly from *L. crustulata*, but differing in the lighter coloured hypothecium, the somewhat smaller spores, and the colour reaction of the thallus.

Hab. On chalk and flints.—*Distr.* Not common in S. and central England.—*B. M.* Shanklin, I. of Wight; Matlock, Derbyshire.

120. **L. polyantha** Tayl. ex Leight. Lich. Fl. ed. 3, p. 252 (1879).—Thallus pale-brown, tartareous, thin, plane, rimulose-areolate, furfuraceous (K + yellow, CaCl + orange-yellow). Apothecia black, small, innate, sessile, with a thick prominent entire margin; hypothecium pale-reddish; paraphyses distinct, pale at the tips, spores ellipsoid or oblong, 0,011–12 mm. long, 0,007 mm. thick; hymenial gelatine blue, the asci brown, with iodine. Specimen not seen.

Hab. On sandstone.—*Distr.* Rare in S. England and Wales.

121. **L. confluens** Ach. Meth. p. 40 (1803) pro parte.—Thallus determinate or subeffuse, thickish, faintly cracked-areolate, opaque, smoky-white or bluish-grey (K−, CaCl−, medulla I + violet); hypothallus black. Apothecia moderate in size or somewhat large, scattered or crowded and often confluent, appressed or adnate, plane and marginate, becoming convex and immarginate, black; hypothecium brownish-black; paraphyses slender, greenish or dark-olive-brown at the apices; spores ellipsoid, rather small, 0,009–15 mm. long, 0,005–7 mm. thick; hymenial gelatine deep blue with iodine.—S. F. Gray Nat. Arr. i. p. 464 pro parte; Hook. in Sm. Engl. Fl. p. 175; Tayl. in Mackay Fl. Hib. ii. p. 118 pro parte; Cromb. Lich. Brit. p. 80 (excl. var.); Leight. Lich. Fl. p. 295; ed. 3, pp. 303–4 (incl. forms *lævigata* and *rimoso-areolata*). *L. contigua* var. γ *confluens* Mudd Man. p. 210 (1861). *Lichen confluens* Weber Spicil. Fl. Goett. p. 180, t. 2 (1778); With. Arr. ed. 3, iv. p. 8 (excl. vars.); Engl. Bot. t. 1964.

Exsicc. Cromb. n. 182; Mudd. n. 180; Johns. nos. 383, 384.

Differs from *L. contigua* in the frequently confluent apothecia, the chemical reaction of the medulla, and the much smaller spores. Where the apothecia are complicate by excessive lateral pressure and reticulate from the prominent margins it is f. *complicata* Leight. (Lich. Fl. ed. 3, p. 304), represented in the British Museum by two specimens from Cader Idris, Merioneth, and from Morrone, Braemar, Aberdeenshire. In f. *steriza* Leight. (*l. c.*) the thallus is evanescent; in f. *minor* Leight. (*l. c.*) the apothecia are minute, plane or convex, and more or less confluent.

Hab. On rocks and stone walls.—*Distr.* Common in mountainous districts, rare in S. England.—*B. M.* Near St. Austell, Cornwall; Ardingly Rocks and Arundel, Sussex; Ulting, Essex; Ayton Moor, Cleveland, Yorkshire; Cader Idris, Merioneth; Snowdon, Carnarvonshire; West Water, Fife; Sidlaw Hills, Forfarshire; Ben More, Ben Lawers, Cairn Gowar, Blair Athole and near Killin, Perthshire; Achosragan Hill, Appin, Argyll; Ben Nevis, Invernessshire; Morrone, Braemar, Aberdeenshire.

Form **oxydata** Leight. Lich. Fl. ed. 3, p. 304.—Thallus rusty-red or yellowish. Apothecia confluent or scattered.

Hab. On rocks.—*Distr.* Somewhat rare in mountainous districts.—*B. M.* Beddgelert, Merioneth; Achosragan Hill, Appin, Argyll; Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire.

122. **L. cinerascens** A. L. Sm.—Thallus determinate or subeffuse, cracked-areolate, whitish or glaucous-white (K−, CaCl−, medulla I + bluish); hypothallus whitish, at times limiting the thallus. Apothecia submoderate, at first innate, plane, with whitish-suffused epithalline margin, at length convex, prominent and immarginate, black, naked or slightly pruinose; hypothecium thick, blackish; paraphyses slender, conglutinate, dark at the apices; spores ellipsoid, 0,010–13 mm. long, 0,005–7 mm. thick; hymenial gelatine deep-blue with iodine.—*Lecidea speirea* Ach. Meth. p. 52 (1803) in Vet. Ak. Handl. 1808, p. 263; Cromb. in Grevillea xii. p. 57. *L. contigua* var. *speirea* Cromb. Lich. Brit. p. 80. *Lichen speireus* Ach. Prodr. p. 59 (1798). *Lichen cinerascens* With. Arr. ed. 3, iv. p. 8 (1796); Cromb. in Grevillea xii. p. 57.

Scarcely distinct from the preceding, but differs in the pseudo-lecanorine apothecia, which are usually more scattered and solitary though at times subconfluent.

Hab. On rocks, schistose and calcareous, in mountainous regions. —*Distr.* In N. England, the Highlands of Scotland, and W. Ireland.—*B. M.* Alston, Cumberland; Achosragan Hill, Appin, Argyll; Craig Calliach, Ben Lawers, Killin, and Craig Tulloch, Blair Athole, Perthshire; Canlochan, Forfarshire; Morrone, Braemar, Aberdeenshire; Ballaghbeama Gap, Kerry; Kylemore, Connemara, Galway.

123. **L. Mooreana** Carroll in Nat. Hist. Rev. vi. p. 529 (1859). —Thallus effuse, thin, greenish-yellow or brown, greyish-white when dry. Apothecia large, black, sessile, solitary or aggregate into little groups, plane, somewhat rough, the margin thin, entire; hypothecium thin, dark-brown; paraphyses slender; the whole hymenium gelatinous; spores ovate, small, 0,007–10 mm. long, 0,004 mm. thick; hymenial gelatine yellow-brown with iodine.—Mudd Man. 207; Cromb. Lich. Brit. p. 82; Leight. Lich. Fl. p. 275; ed. 3, p. 275.

Hab.—On rocks.—*B. M.* Crow Glen, Belfast (the only locality).

124. **L. promiscens** Nyl. in Flora lv. p. 358 (1872).—Thallus effuse, very thin, cracked-areolate, whitish (K −, CaCl −, I + dark-violet), often evanescent. Apothecia adnate, moderate, plane, thinly margined, at length slightly convex and immarginate, black, concolorous within; paraphyses slender, clavate, jointed and black at the apices; hypothecium brown (NO_3 rose-coloured); spores oblong, 0,008–14 mm. long, 0,003–4 mm. thick; hymenial gelatine deep-blue, asci at length wine-red, with iodine.—Cromb. in Journ. Bot. xxii. p. 275 (1882).

In the two British specimens, which are well fertile, the thallus is almost obsolete. It might readily be taken for an ecrustaceous state of *L. lapicida*, but differs in the thinner spores. Its nearest ally is *L. promiscua* Nyl., a plant of the Pyrenees, where this species also was originally detected. The spermogones are not unfrequent with spermatia straight, 0,009–14 mm. long, 0,0005–6 mm. thick.

Hab.—On a quartzose boulder in a subalpine situation.—*B. M.* Morrone, Braemar, Aberdeenshire (the only locality).

125. **L. silacea** Ach. Meth. p. 48 (1803).—Thallus areolate, the areolæ convex, tumid, smooth, bright ferruginous or ochraceous-red (K −, CaCl −). Apothecia violet-black, numerous, scattered or crowded, varying in size, closely adnate on or between the areolæ, plane or convex with an entire or flexuose margin; hypothecium dark-brownish, the base of the asci often greenish-blue; paraphyses distinct, violet-black at the tips; spores roundish-oblong, rather small, 0,010–11 mm. long, 0,005–6 mm. thick.—Leight. Lich. Fl. ed. 3, p. 288. *L. lapicida* var. *silacea* Mudd Man. p. 209 (1861) (excl. syn.); Cromb. Lich. Brit. p. 70; Leight. Lich. Fl. p. 285? *Patellaria silacea* Hoffm. Pl. Lich. i. p. 89, t. 19, f. 2 (1790)?

The tumid convex areolæ and the dark hypothecium separate this species, as now understood, from the ferruginous-ochraceous forms of *L. lithophila*. It is impossible to be sure of the citations from older authors, as their descriptions are often imperfect. *L. silacea* (Engl. Bot. t. 1118) is probably *L. lithophila* f. *ochracea*, under which it has been quoted.

Hab. On rocks.—*Distr.* Somewhat rare in mountainous districts.—*B. M.* Sidlaw Hills and Glen Fender, Perthshire; Glen Callater, Braemar, Aberdeenshire.

126. **L. tessellata** Floerke Deutschl. Lich. 4, p. 5 (1819).—Thallus whitish or greyish, tartareous, areolate, the areolæ plane or convex (K −). Apothecia scattered or confluent, sessile, adnate, black, slightly pruinose, plane or subconvex with a thin flexuose margin; hypothecium colourless; paraphyses loosely coherent, slightly thickened and brownish-black at the apices; spores ellipsoid, 0,009–12 mm. long, 0,004–6 mm. thick; hymenial gelatine blue then sordid, the asci violet-red, with iodine.—Cromb. Lich. Brit. p. 82; Leight. Lich. Fl. p. 276; ed. 3, p. 279. *L. lapicida* var. *cyanea* Ach. Meth. p. 38 (1803). *L. spilota* Fr. Syst. Orb. Veg. p. 286 (1825); Leight. Lich. Fl. p. 277; ed. 3, p. 279. *L. pantosticta* var. *spilota* Ach. Lich. Univ. p. 154 (1810)?

Hab. On alpine rocks, not common.—*B. M.* Ben Lawers, Perthshire; Glen Callater, Braemar, Aberdeenshire.

127. **L. lapicida** Ach. Meth. p. 37 (1803) pro parte.—Thallus tartareous, thin, minutely cracked-areolate, the areolæ plane, whitish or ash-grey. Apothecia appressed or adnate, plane or

slightly concave with a thin prominent margin; hypothecium pale or brownish; paraphyses loosely coherent, blue-greenish-black or dark-brown at the apices; spores ellipsoid, 0,009–13 mm. long, 0,004–6 mm. thick; hymenial gelatine blue then sordid with iodine.—Mudd Man. p. 209 pro parte; Cromb. Lich. Brit. p. 81 pro parte (excl. vars.); Leight. Lich. Fl. p. 284 (excl. vars.); ed. 3, p. 289 (excl. var.). *L. polycarpa* Floerke ex Sommerf. Suppl. Fl. Lapp. p. 149 (1826); Cromb. Lich. Brit. p. 82; Leight. Lich. Fl. p. 283; ed. 3, p. 288. *Lichen lapicida* Ach. Lich. Suec. Prodr. p. 61 (1798).

Exsicc. Johns. nos. 350, 387.

Th. Fries (Lich. Scand. pp. 491, 493) places *L. polycarpa* under *L. pantherina*, of which he regards *L. lapicida* as a subspecies. The only difference between the two is in the reaction with potash; in *L. polycarpa* the reaction varies from yellow to yellow followed by red, while in *L. lapicida* there is usually no colour-reaction. Fries further states that some specimens of *lapicida* give no reaction in one part of the thallus, while in another they tinge red. The reaction of our specimens varies from a faint yellow to crimson.

Hab. On granitic and schistose rocks.—*Distr.* Found chiefly in mountainous regions.—*B. M.* Cader Idris, Merioneth; Llyn Geironydd, Trefriw; Nant Francon and Llanberis, Carnarvonshire; Morrone, Braemar, Aberdeenshire; coast of Kincardineshire.

Var. **declinans** Nyl. Lich. Scand. p. 226 (1861).—Similar to the type but with a darker hypothecium and nearly ecrustaceous thallus (K+ yellow, then red).—Leight. in Ann. Mag. Nat. Hist. ser. 3, xix. p. 403 (1867); Cromb. Lich. Brit. p. 81. *L. polycarpa* var. *declinans* Leight. Lich. Fl. p. 284 (1871); ed. 3, p. 289. *L. declinans* Nyl. in Flora lxi. p. 243 (1878).

Hab. On rocks in mountainous regions. Specimen not seen.—*B. M.* Two doubtful specimens without spores from Ben Lawers, Perthshire, and Braemar, Aberdeenshire, collected and named by Carroll.

128. **L. lithophila** Ach. Syn. p. 14 (1814).—Thallus tartareous, whitish or ashy-grey, thin, cracked-areolate, the areolæ plane (K−, CaCl−); hypothallus black. Apothecia numerous, moderate in size or small, scattered or aggregate and angular, plane, brownish-black, velvety and soft, with a thin prominent flexuose margin; hypothecium colourless or pale; paraphyses slender, loosely coherent, sometimes with a greenish tinge, clavate, and blackish-brown at the tips; spores ellipsoid, 0,009–12 mm. long, 0,005–6 mm. thick; hymenial gelatine deep-blue with iodine.—Cromb. Lich. Brit. p. 82; Leight. Lich. Fl. p. 285; ed. 3, p. 290.

Exsicc. Cromb. n. 183.

Spores rarely well developed. Differs from other species in the same group in the black velvety apothecia and the thickened apices of the paraphyses. When the apothecia are very small and the thallus almost evanescent it is f. *minor* Cromb. MS., two specimens

of which from Ben Lawers are in the British Museum. Nylander states that the epithecium usually turns reddish when moist.

Hab. On rocks in upland or mountainous regions.—*Distr.* Somewhat rare in S.W. and N. England, Wales, and W. Ireland, frequent on the Grampians, Scotland.—*B. M.* Cader Idris, Merioneth; Cwm Llugwy, Carnarvonshire; Ben Lomond, Stirlingshire; Stronachlachan, Killin, Ben Lawers, Ben Vrackie, Craig Calliach, Glen Fender and Craig Tulloch, Blair Athole, Perthshire; Achosragan Hill, Appin, Argyll; Glen Callater and Morrone, Braemar, Aberdeenshire; Applecross, Rossshire.

Form **ochracea** Nyl. Lich. Scand. p. 227 (1861).—Differs from the type in the yellowish or rusty-red colour of the thallus.—*L. daphœna* var. *ochracea* Ach. Lich. Univ. p. 166 (1810). *L. tessellata* f. *ochracea* Cromb. Lich. Brit. p. 82 (1871). *L. lapicida* var. *ochracea* Leight. Lich. Fl. ed. 3, p. 290 (1879). *L. silacea* Ach. Meth. p. 48 (1803) pro parte; Engl. Bot. t. 1118; Hook. in Sm. Engl. Fl. p. 178.

Hab. On rocks.—*Distr.* Somewhat rare in S.W. England, Wales and Scotland.—*B. M.* Alternan, Cornwall; Beddgelert, Llyn Geironwydd, Carnarvonshire; Glen Fender and Craig Tulloch, Blair Athole, Perthshire; Achosragan Hill, Appin, Argyll; Morrone, Braemar, Aberdeenshire.

129. **L. plana** Nyl. in Flora lviii. p. 448 (1875).—Thallus effuse, thinnish, areolate-rimose, greyish- or glaucous-white (K−, CaCl−, medulla I−), often evanescent; hypothallus black. Apothecia small, adnate, plane, thinly margined, usually crowded, black, the margin entire; paraphyses loosely coherent, narrowly clavate and dark-brown or greenish-black at the apices; hypothecium colourless; spores narrowly oblong, 0,009–12 mm. long, 0,0025–40 mm. thick; hymenial gelatine deep blue with iodine.—Cromb. in Grevillea i. p. 173; Leight. Lich. Fl. ed. 3, p. 290. *L. lapicida* subsp. *lithophiloides* Nyl. ex Cromb. Lich. Brit. p. 81 (1870); var. *lithophiloides* Leight. Lich. Fl. p. 285. *Lecidella plana* Lahm ex Koerb. Par. Lich. p. 211 (1861).

Exsicc. Leight. n. 157; Mudd n. 178.

Resembles a small condition of the preceding, but is well distinguished by the persistently black apothecia and the narrower spores. The thallus is somewhat variable, being either continuous, scabrid or smoothish, or more or less scattered; at times granulate-verrucose (form *perfectior* Nyl. in Flora lxiv. p. 539 (1881)), and not unfrequently obsolete. The numerous apothecia are usually confluent and then variously angulose or difform.

Hab. On rocks and boulders, chiefly granitic and schistose in mountainous regions.—*Distr.* Found only here and there in Central and N. England, N. Wales and among the Grampians, Scotland.—*B. M.* Near Buxton, Derbyshire; Cader Idris, Merionethshire; Kildale Moor, Ayton Moor and Ingleby, Cleveland, Yorkshire; Camlochan, Forfarshire; Ben Lawers and Stronachlachan, Killin, Perthshire; Ben-naboord, Braemar, Aberdeenshire.

130. **L. mesotropa** Nyl. in Flora l. p. 328 (1867).—Thallus indeterminate, verrucose-areolate, greyish; the areolæ rather convex (K−, K(CaCl)+ reddish). Apothecia small, adnate, somewhat plane, opaque, margined, blackish or brownish-black, the margin obtuse, at length evanescent; paraphyses slender, not well discrete; epithecium brownish; hypothecium colourless; spores ellipsoid, colourless, 0,009–13 mm. long, 0,005–6 mm. thick; hymenial gelatine bluish with iodine.—Cromb. in Journ. Bot. vii. p. 49 (1869) & Lich. Brit. p. 81; Leight. Lich. Fl. p. 277; ed. 3, p. 280.

Intermediate between *L. lapicida* and *L. lithophila*, the thallus much resembling the former and the apothecia those of the latter species. The apothecia have often a biatorine aspect.

Hab. On a gneissic boulder in an upland mountainous region.—*B. M.* West slope of Ben Lomond, near Loch Ard, Perthshire (the only locality).

131. **L. mesotropoides** Nyl. in Flora lv. p. 359 (1872).—Thallus subdeterminate, moderate, verrucose-areolate-diffract greyish, the areolæ convex (K+ yellowish, CaCl−, medulla I−). Apothecia small, prominent, blackish, at first plane and thinly margined, then convex and immarginate; paraphyses slender, more or less coherent; hypothecium colourless; spores ellipsoid, 0,009–11 mm. long, 0,006–7 mm. thick; hymenial gelatine bluish with iodine.—Cromb. in Grevillea i. p. 69; Leight. Lich. Fl. ed. 3, p. 282.

Distinguished from *L. mesotropa* by the thalline reactions, the thinner apothecia and the shorter spores. The two British specimens are well fertile. The spermogones, here and there visible, have the spermatia 0,007–0,010 mm. long, scarcely 0,001 mm. thick.

Hab. On calcareous and schistose stones of a wall in an upland situation.—*B. M.* Craig Tulloch, Blair Athole, Perthshire (the only locality).

132. **L. mesotropiza** Nyl. in Flora lvi. p. 20 (1873).—Thallus indeterminate, moderate, verrucose-rugulose, whitish (K+ deep yellow, CaCl−). Apothecia small or submoderate, more or less crowded, adnate, black, at first plane and thinly margined, at length convex, immarginate, sometimes slightly pruinose, bluish-grey within; paraphyses not very discrete; epithecium dark-greenish-blue; hypothecium colourless; spores ellipsoid, 0,011–12 mm. long, 0,007 mm. thick; hymenial gelatine bluish, the asci violet, with iodine.—Cromb. in Grevillea i. p. 142; Leight. Lich. Fl. ed. 3, p. 275.

Externally very similar to the preceding, from which it differs chiefly in the whitish verrucose thallus and the bluish epithecium.

Hab. On schistose stones of a wall in an upland district.—*B. M.* Hill of Ardo, near Aberdeen (the only locality).

133. **L. tephrizans** Leight. in Trans. Linn. Soc. ser. 2, i. p. 257, t. 32, figs. 3 and 4 (1878).—Thallus almost obsolete, only a few whitish depressed scattered areolæ remaining (K−, CaCl−); hypothallus predominating, blackish-grey. Apothecia black, numerous, plane or slightly concave, prominent, sessile, with a thickish margin eventually obliterated; hypothecium blackish-brown subtended by a pale-greyish-blue hyaline excipulum, the hymenium thin, pale-greyish-blue; paraphyses distinct, conglomerate, blackish at the tips; spores narrowly ellipsoid, minute, 0,009–10 mm. long, 0,005 mm. thick; hymenial gelatine dirty-blue with iodine; spermatia minute, shortly cylindrical, straight.—Leight. Lich Fl. ed. 3, p. 311. Specimen not seen.

Hab. On hard slaty rocks.—*Distr.* Rare in Wales and W. Ireland.

134. **L. lactea** Floerke ex Schær. Spicil. p. 127 (1812).—Thallus yellowish-white or ashy-grey, thin, smooth, cracked-areolate, the areolæ plane (K+ yellow, then deep orange-red). Apothecia numerous, scattered or aggregate, innate, plane, naked or pruinose with a thinnish prominent entire or flexuose margin; hypothecium dark-brown; paraphyses distinct somewhat clavate and greenish-black at the apices; spores ellipsoid, 0,012–15 mm. long, 0,005–7 mm. thick; hymenial gelatine bluish with iodine. —Cromb. Lich. Brit. p. 83; Leight. Lich. Fl. p. 289; ed. 3, p. 295. *L. ambigua* Fr. Lich. Suec. Exs. n. 407; Stenh. Sched. Crit. xiv. p. 11 (1833) (non Ach.); Mudd Man. p. 206 pro parte.

Exsicc. Leight. n. 301; Johns. n. 351.

The smooth thallus and innate apothecia with prominent margin, resembling somewhat those of *Lecanora Dicksonii*, give a distinctive character to this species. It differs from *L. plana* in the dark hypothecium and the somewhat larger spores. The apothecia are sometimes immersed and the surrounding thallus is broken away.

Hab. On rocks in maritime and mountainous districts.—*Distr.* Somewhat rare in N. Wales, N. England, E. and N. Scotland, and S.W. Ireland.—*B. M.* Cader Idris, Dolgelly, and Barmouth, Merioneth; Trefriw and Capel Curig, Carnarvonshire; Cwm Ffynon, Flint; near Thirsk, Yorkshire; Camlochan, Forfarshire; Portlethen, Kincardine; Achosragan Hill, Appin, Argyll; Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire; Mangerton, Kerry.

135. **L. subkochiana** Cromb. in Journ. Bot. ix. p. 179 (1871). —Thallus crustaceous, smooth, whitish or greyish, determinate, cracked-areolate, the areolæ plane, contiguous (K+ yellowish then red, CaCl−). Apothecia black, numerous, innate or sessile with a prominent margin; hypothecium colourless or pale-brownish; paraphyses dark-brown at the tips; spores ellipsoid, small, 0,008–12 mm. long, 0,005–6 mm. thick; hymenial gelatine blue with iodine.—Leight. Lich. Fl. ed. 3, p. 295. *L. tessellata* f. *subkochiana* Nyl. in Flora lii. p. 85 (1869).

The apothecia resemble in outward form those of *L. lactea*, but differ in the lighter hypothecium and the somewhat smaller spores.

Hab. On schistose rocks in maritime and subalpine regions.—*Distr.* Rare in Wales and N.E. Scotland.—*B. M.* Llyn Geironydd and Trefriw, Carnarvonshire; coast of Kincardineshire.

136. **L. contiguella** Nyl. in Flora lvi. p. 295 (1873).—Thallus determinate, thinly areolate-rimose, whitish (K−, CaCl−, medulla I−); hypothallus black, limiting the thallus. Apothecia moderate, adnate, plane, thinly margined, black, concolorous within; paraphyses slender, almost distinct; epithecium bluish-black; hypothecium brown; spores oblong, 0,011–15 mm. long, 0,0045–55 mm. thick; hymenial gelatine bluish then wine-reddish with iodine.—Cromb. in Grevillea ii. p. 90; Leight. Lich. Fl. ed. 3, p. 296.

Resembles *L. lactea* Floerke, but is well distinguished by the absence of any thalline reactions. The apothecia are often crowded and angulose, with the margin more or less flexuose. The spermogones, rarely present in the single specimen gathered, have the spermatia bacillar, about 0,007 mm. long, 0,001 mm. thick.

Hab. On a felspathic boulder in an alpine locality.—*B. M.* Morrone, Braemar, Aberdeenshire (the only locality).

137. **L. auriculata** Th. Fr. Lich. Arct. p. 213 (1860).—Thallus whitish, ashy-grey or brownish, cracked-areolate sometimes evanescent (K−, CaCl−). Apothecia appressed or adnate, at first plane then more or less convex with the centre somewhat depressed-umbilicate, margin persistent, flexuose, becoming rounded-lobate; hypothecium thick, blackish-brown; paraphyses loosely coherent, clavate and dark-brown or greenish-blue-black at the apices; asci somewhat scarce; spores ellipsoid-oblong, small, 0,006–11 mm. long, 0,0025–4 mm. thick; hymenial gelatine deep-blue with iodine.—*L. sarcogyniza* Nyl. in Flora li. p. 475 (1868). Cromb. in Journ. Bot. vii. p. 106 (1869) & Lich. Brit. p. 82; Leight. Lich. Fl. p. 289; ed. 3, p. 312. *L. phylliscocarpa* Nyl. in Flora lvii. p. 314 (1874); Cromb. in Grevillea iii. p. 23; Leight. Lich. Fl. ed. 3, p. 312.

Distinguished by the irregular lobate apothecia which sometimes form shallow pits in the substratum more or less white-farinose (I−) at the base.

Hab. On rocks in maritime and mountainous regions.—*Distr.* Somewhat plentiful on the Grampians and on the east coast of Scotland.—*B. M.* Glen Fender and Craig Tulloch, Blair Athole, Ben Lawers and Ben Vrackie, Perthshire; near Portlethen, Kincardine; Hill of Ardo and Morrone, Braemar, Aberdeenshire; Ben Cruachan, Argyll; Glen Nevis, Invernessshire.

Var. *β* **diducens** Th. Fr. Lich. Scand. p. 499 (1874).—Thallus evanescent. Apothecia scattered or usually aggregate.—*L. diducens* Nyl. in Flora xlviii. p. 148 (1865); Cromb. Lich. Brit. p. 85; Leight. Lich. Fl. p. 298; ed. 3, p. 309. *L. confœderans*

Nyl. in Flora lvi. p. 296 (1873); Cromb. in Grevillea ii. p. 91; Leight. Lich. Fl. ed. 3, p. 312.

Occasionally 20 or 30 small apothecia are conglomerate; the isolated apothecia are larger and have a thicker margin.

Exsicc. Larb. Lich. Cæsar. n. 39.

Hab. On granitic rocks in maritime and mountainous regions.—*Distr.* Somewhat rare in the Channel Islands, W. Ireland, and the N. of Scotland.—*B. M.* Le Fret, Noirmont, Jersey; Ben Lawers, Ben Vrackie, and Ben-y-gloe, Perthshire; Morrone, Braemar, Aberdeenshire; Sands of Culbin, Morayshire.

138. **L. sarcogynoides** Koerb. Syst. Lich. Germ. p. 252 (1855).—Thallus greyish, effuse or absent. Apothecia black, scattered or crowded and aggregate and then difform, closely adnate, plane with a prominent flexuose margin; hypothecium thicker, blackish-brown, hymenium narrow, bluish-grey; paraphyses thick, conglutinate, black at the apices; spores minute, ellipsoid-elongate.—Leight. Lich. Fl. ed. 3, p. 313.

A doubtful species. There is one specimen in the British Museum, collected and named by Larbalestier. The hymenium is bluish-grey with a pinkish tinge, especially in a thick section. The spores are undeveloped; their measurements are nowhere recorded.

Hab. On rocks.—*B. M.* La Moye, Jersey.

139. **L. phylliscina** Nyl. in Flora lvi. p. 21 (1873).—Thallus obsolete or scarcely visible. Apothecia moderate, umbilicately affixed, thick, obtusely margined and sublobulate, black, concolorous within; paraphyses submoderate; hypothecium thick and with the perithecium (in thin section) yellowish-infuscate (K+ purplish); fully developed spores not seen; hymenial gelatine deep-blue, the asci at length wine-reddish with iodine. —Cromb. in Journ. Bot. xi. p. 141 (1875).

The apothecia are often aggregate and sometimes umbonate. A doubtful species, since the spores in all known specimens both from Lapland and Scotland are immature.

Hab. On a quartzose boulder.—*B. M.* Morrone, Braemar, Aberdeenshire.

140. **L. umbonella** Nyl. in Flora xlix. p. 372 (1866).—Thallus determinate, in small roundish patches, areolate, smooth, whitish or pale-yellowish (K+ yellow, then reddish, CaCl−). Apothecia small, innate, margined, usually subgyrose or umbonate in the centre, black; paraphyses rather slender; epithecium nearly colourless; hypothecium brown or brownish (the umbo and perithecium brownish-black in thin section); spores ellipsoid, 0,011–14 mm. long, 0,006–8 mm. thick; hymenial gelatine bluish with iodine.—Leight. in Ann. Mag. Nat. Hist. ser. 3, xix. p. 332 (1867); Cromb. Lich. Brit. p. 85; Leight. Lich. Fl. p. 297; ed. 3, p. 305.

The thallus grows in small more or less insulated patches, and is at times associated with *L. polycarpa*. The apothecia, at length slightly prominent, are usually numerous on the thalline patches. The spermogones, solitary or congregate and somewhat prominent, are frequent, with spermatia cylindrical, straight, 0,006–7 mm. long, scarcely 0,001 mm. thick.

Hab. On schistose rocks in mountainous regions.—*Distr.* Rare on the Scottish Grampians.—*B. M.* Ben More, Perthshire; Cairn Turc, Braemar, Aberdeenshire.

141. **L. illita** Nyl. in Flora lxii. p. 356 (1879).—Thallus effuse, thin or very thin, applanate, cracked-areolate, the areolæ angulose, yellowish-brown or pale-greyish (K(CaCl)+ reddish, medulla CaCl+ reddish); hypothallus very thin, umbrine-black. Apothecia minute, innate, margined, umbonate in the centre, black; paraphyses slender, scanty; perithecium and umbo brownish-black in thin section; hypothecium thin, almost colourless; spores ellipsoid, 0,012–16 mm. long, 0,008–0,011 mm. thick; hymenial gelatine tawny-wine-reddish with iodine.—Cromb. in Grevillea viii. p. 112. Specimen not seen.

Differs from the preceding in the thalline reaction. Apothecia 1 or 2 in each thalline areola; the spermogones have the spermatia acicular, 0,005–6 mm. long, 0,0005 mm. thick, on simple, moderate sterigmata. It has been detected at Mozi in Japan (*vide* Nyl. Lich. Jap. p. 75), with larger spores, 0,014–20 mm. long, 0,009–13 mm. thick.

Hab. On argillaceous schist at Clifton, Somersetshire.

142. **L. alumnula** Nyl. in Flora lix. p. 574 (1876).—Thallus determinate, thin, white (K−, CaCl−); hypothallus black, limiting the thallus. Apothecia minute, subinnate, plane, margined, often subumbonate in the centre, black; paraphyses concrete, brownish-black at the apices; hypothecium brownish-black; spores ellipsoid, 0,009–0,012 mm. long, 0,005–6 mm. thick; hymenial gelatine bluish, the asci at length pale-wine-coloured with iodine.—Cromb. in Grevillea v. p. 107; Leight. Lich. Fl. ed. 3, p. 302.

Frequently grows in sublobulate patches on the thallus of *L. contigua*. Our specimens are well fertile, with the apothecia at times subconfluent.

Hab. On quartzose rocks of a stream in an upland district.—*B. M.* Base of Diamond Mt. and Letterfrack, Connemara, Galway (the only locality).

143. **L. limborina** A. L. Sm.—Thallus thin or obsolete, effuse, blackish or greyish, slightly rimulose. Apothecia small, black, adnate or appressed, centrally umbonate or tuberculate, the margin tumid, incurved and uneven; hypothecium dull-brown; paraphyses indistinct, becoming black and carbonaceous at the tips; spores ellipsoid, colourless becoming brown, 0,018–

30 mm. long, 0,011–16 mm. thick or smaller.—*L. trochodes* Cromb. Lich. Brit. p. 94 (1870); Leight. Lich. Fl. p. 257; ed. 3, p. 250 & in Grevillea iv. p. 23. *Opegrapha saxigena* var. *trochodes* Taylor ex Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 93 (1854). *Rimularia limborina* Nyl. in Flora li. p. 346 (1868); Cromb. Lich. Brit. p. 106; Leight. Lich. Fl. p. 406; ed. 3, p. 438.

The name *trochodes* originated with Taylor in MS.; he had labelled a specimen of this lichen, collected in Carig Mt., Kerry, *Opegrapha saxigena* var. *trochodes*. By an error Leighton and Crombie have quoted this name as if published by Taylor under *O. saxigena* in Mackay Fl. Hib. ii. p. 259 (1836).

Hab. On rocks. Rare in the N. Grampians of Scotland and in S.W. Ireland.—*B. M.* Craig Guie, Braemar, Aberdeenshire; Dunkerron, Kerry.

144. **L. subgyratula** Nyl. in Flora lvi. p. 296 (1873).—Thallus thin and discontinuous, dark-brown or blackish, opaque, faintly cracked. Apothecia black, small, tuberculate or gyrose; hypothecium blackish; paraphyses slender, not distinct; epithecium brownish; spores ellipsoid, 0,016 mm. long, 0,009 mm. thick; hymenial gelatine pale-blue then tawny-wine-red with iodine.—Leight. in Grevillea iv. p. 26, t. 52, figs a, b, & Lich. Fl. ed. 3, p. 250.

Differs from the preceding in the more tuberculate apothecia and in the smaller colourless spores.

Hab. On granitic rocks.—*B. M.* Summit of Morrone, Braemar, Aberdeenshire (the only locality).

145. **L. aglæa** Sommerf. Suppl. Fl. Lapp. p. 144 (1826); Nyl. Lich. Scand. p. 228.—Thallus indeterminate, thickish, warted-areolate, the areolæ tumid, convex somewhat shining, yellowish (K + yellow, CaCl −, K(CaCl + yellow); hypothallus black. Apothecia adnate, moderate, convex, immarginate, somewhat shining, black; paraphyses coherent, dark-greenish at the apices, epithecium bluish-black; hypothecium colourless or sordid; spores ellipsoideo-oblong, 0,010–16 mm. long, 0,006–8 mm. thick; hymenial gelatine deep-blue, the asci at length often sordid-violet, with iodine.—Cromb. in Journ. Bot. viii. p. 99 (1870); Leight. Lich. Fl. p. 275; ed. 3, p. 278. *L. areolata* Carroll in Journ. Bot. iv. p. 24 (1866) (non Schær.); Cromb. Lich. Brit. p. 82; Leight. Lich. Fl. p. 276; ed. 3, p. 279. *Lichen miscellus* Sm. Engl. Bot. t. 1831 (1808) (non Ach.).

Allied to *L. fuscoatra*, differing chiefly in the more massive thallus, the thalline reactions, and the rather larger spores. The areolæ, at length somewhat rugose, are either crowded or more or less scattered, in which latter case the hypothallus is more visible. The apothecia, usually numerous, are only in a young state very thickly margined; at times they are crowded, more convex, confluent and difform. The very common spermogones have the spermatia straight,

oblong, 0,006–9 mm. long, 0,0015 mm. thick. I follow Leighton's suggestion in including the plant referred by Carroll to *L. areolata* Schær.; there is no specimen in the British Museum.

Hab. On rocks and boulders, granitic and schistose, in mountainous regions.—*Distr.* Not uncommon in N. Wales and among the Grampians, Scotland; rare in N. England and W. Ireland.—*B. M.* Cader Idris and Moel Gader, Dolgelly, Merioneth; Twll Du, Nant Francon, Carnedd Dafydd, Trefriw, and Llyn Geirionydd, Carnarvonshire; near Winch Bridge, Teesdale, Durham; Ben Cruachan, Argyll; Ben Lawers, Craig Tulloch, Craig Calliach and Ben Vrackie Perthshire; Glen Callater, Braemar, Aberdeenshire; Kylemore, Connemara, Galway.

Form **Crombiei** Nyl. in Flora liii. p. 38 (1870).—Thallus sulphur-yellow or whitish-yellow. Apothecia innate, somewhat convex; spores 0,010–12 mm. long, 0,006–7 mm. thick.—Cromb. in Grevillea i. p. 173. *L. Crombiei* Jones ex Nyl. in Flora li. p. 345 (1868); Cromb. in Journ. Bot. vii. p. 49 (1869), & Lich. Brit. p. 82.

Differs only in the colour of the thallus (which, however, becomes darker in the herbarium), in the constantly innate apothecia and the rather smaller spores.

Hab. On rocks, granitic and schistose, in mountainous districts.—*Distr.* Only a few localities in N. Wales, the Grampians, Scotland, and W. Ireland.—*B. M.* Dolgelly, Merioneth; Craig Tulloch, Blair Athole, Perthshire; The Khoil, Glen Callater, and Morrone, Braemar, Aberdeenshire; Mangerton, Killarney, Kerry; Doughruagh Mt., Connemara, Galway.

146. **L. armeniaca** Fr. Syst. Orb. Veg. i. p. 286 (1825); Schær. Spicil. pp. 126, 193.—Thallus subdeterminate, thick or thickish, rimoso-areolate, the areolæ plane or somewhat convex, rugose, sometimes imbedded in the rock, yellow-ochraceous or yellowish-red (K+ yellow, then crimson, CaCl−, K(CaCl−); hypothallus bluish-black. Apothecia innate, moderate, subplane, or often convex, black, immarginate, dark within; paraphyses concrete, dark-olive-brown at the apices; hypothecium colourless or sordid; spores ellipsoid or oblong, 0,009–0,013 mm. long, 0,004–6 mm. thick; hymenial gelatine deep-blue with iodine.—Cromb. Lich. Brit. p. 83; Leight. Lich. Fl. p. 251 pro parte; ed. 3, p. 243, pro parte. *Rhizocarpon armeniacum* DC. Fl. Fr. ii. p. 366 (1805).

Readily distinguished by the ultimate colour of the thallus and by the thalline reactions. Represented in the British Islands by two varieties, both of which, according to Nylander, grow together with intermediate states on the mountains of Dauphiné.

Var. *β* **aglæoides** Nyl. in Act. Soc. Sci. Fenn. vii. p. 401 (1863).—Thallus normally yellow or pale-ochroleucous, the areolæ usually rugose. Apothecia convex; spores 0,009–0,013 mm. long, 0,0045–55 mm. thick.—Cromb. Lich. Brit. p. 83.

Nylander (in Bull. Soc. Linn. Norm. ser. 2, vi. p. 278 (1872)) has more recently suggested that this is only a state in which the thallus remains longer of a paler colour, though at length in the herbarium it becomes concolorous with that of the type. In the single British specimen the areolæ are somewhat scattered, with the hypothallus very conspicuous.

Hab. On a granitoid boulder in an alpine situation.—*B. M.* Near the summit of Craig Calliach, Perthshire (the only locality).

Var. γ **lutescens** Nyl. *l. c.*—Thallus smoothish, pale-ochroleucous or whitish, subopaque. Apothecia at length superficial, somewhat convex; spores as in the preceding variety.—*Psora spectabilis* var. *β lutescens* Anzi Cat. Lich. Soudr. p. 66 (1860).

Characterized by the paler thallus which apparently does not become reddish in the herbarium. Nylander says that it often has the aspect of *L. marginata* Schær., but differs from that in the internal colour of the apothecia. The single British specimen is well fertile, both apothecia and spermogones being frequent.

Hab. On a schistose rock in an alpine locality.—*B. M.* Near the summit of Ben Lawers, Perthshire.

147. **L. marginata** Schær. Enum. p. 115 (1850).—Thallus pale-apricot-coloured, tartareous, in irregular scattered patches, rimose-areolate. Apothecia black, sessile, plane or tumid with a thick prominent flexuose margin, at length immarginate; hypothecium pale; spores oblong 0,010–11 mm. long, 0,0065–75 mm. thick; hymenial gelatine blue with iodine.—Cromb. Lich. Brit. p. 83; Leight. Lich. Fl. p. 284; ed. 3, p. 289. Specimen not seen.

Hab. On alpine rocks rare. Collected on Ben Lawers by Admiral Jones.

148. **L. fuscoatra** Ach. Meth. p. 44 (1803) pro parte.—Thallus determinate, areolate, the areolæ plane or slightly convex, brown, chestnut-brown or copper-coloured, somewhat shining (K−, CaCl+ reddish, medulla I−); hypothallus black, usually limiting the thallus. Apothecia moderate in size, black, appressed, at first plane and thinly margined, becoming often convex and immarginate; hypothecium dark-brown; paraphyses coherent, blackish at the apices; spores ellipsoid, or oblong-ellipsoid, 0,010–16 mm. long, 0,005–7 mm. thick; hymenial gelatine bluish then violet-wine-coloured with iodine.—Hook. Fl. Scot. ii. p. 37; S. F. Gray Nat. Arr. p. 463; Hook. in Sm. Engl. Fl. p. 174; Tayl. in Mackay Fl. Hib. ii. p. 117; Cromb. Lich. Brit. p. 83; Leight. Lich. Fl. p. 287; ed. 3, p. 293; var. *gibba* Wahlenb. Fl. Lapp. p. 475 (1812); f. *gibba* Leight. *ll. c.*; f. *dendritica* Cromb. Lich. Brit. p. 83 (1870). *L. fumosa* Ach. Meth. p. 41 (1803); Hook. Fl. Scot. ii. *l. c.* p. 37; S. F. Gray Nat. Arr. i. p. 463 (excl. syn.); Mudd Man. p. 211. *L. cechumena* Ach. Meth. p. 42 (1803); Hook. in Sm. Engl. Fl. v. p. 175.

Lichen fuscoater L. Sp. Pl. ed. 2, p. 1607 (1763); Lightf. Fl. Scot. p. 804; With. Arr. ed. 3, iv. p. 11. *L. fumosus* Ach. Lich. Suec. Prodr. p. 78 (1798). *L. dendriticus* Dicks. Fasc. Pl. Crypt. iv. p. 21 (1801); Engl. Bot. t. 1734 (shows a well-marked radiating hypothallus). *L. cechumenus* Sm. Engl. Bot. t. 1830 (1808). *Verrucaria fumosa* Hoffm. Deutschl. Fl. p. 190 (1795). *V. dendritica* Hoffm. *l. c.* p. 168.

Exsicc. Leight. nos. 215, 216, 239, 306.

Hab. On rocks.—*Distr.* Somewhat frequent in mountainous regions of Wales, N.W. England, Scotland and W. Ireland.—*B. M.* Barmouth and Cader Idris, Merioneth; Malvern and near Droitwich, Worcestershire; Long Mynd and Lyth Hill, Shropshire; Langbaurghrigg, Battersby and High Cliff, Cleveland, Yorkshire; Barcaldine, Argyll; Ben Lawers, Perthshire; Glen Callater, Braemar, Aberdeenshire; Glen Nevis, Invernessshire.

Var. *β* **grisella** Nyl. Lich. Scand. p. 526 (1861).—Thalline areolæ contiguous, plane or somewhat convex, angulose, greyish or whitish, opaque. Apothecia moderate, subinnate, plane or slightly convex, black, often slightly pruinose, dark within, the margin entire; spores as in the type.—*Lecidea grisella* Floerke in Flot. Lich. Siles. (1829) nos. 141, 142; Cromb. Lich. Brit. p. 83. *L. fumosa* var. *γ grisella* Floerke ex Schaer. Enum. p. 110 (1850); Mudd Man. p. 212. *L. fuscoatra* f. *grisella* Leight. Lich. Fl. p. 288; ed. 3, p. 294. *L. interjecta* Nyl. in Flora xlix. p. 418 (1866); Cromb. Lich. Brit. p. 81; Leight. Lich. Fl. p. 299; ed. 3, p. 306. *Lichen diacapsis* Sm. Engl. Bot. t. 1954 (1809).

Exsicc. Mudd n. 182 pro parte; Larb. Lich. Hb. n. 145.

Readily distinguished from the type by the much paler, opaque thallus. The numerous though usually somewhat scattered apothecia are rarely somewhat different; very rarely they are concentrically arranged.

Hab. On rocks and boulders, very rarely on brick walls, from maritime to subalpine tracts.—*Distr.* Here and there in Great Britain; rare in W. Ireland; not found with certainty in the Channel Islands.—*B. M.* Near Hastings, Sussex; Crown Hill, Devon; near Monmouth; Dolgelly, Merioneth; Lyth Hill, Shropshire; Ayton Moor, Cleveland, Langbaurghrigg, Yorkshire; Durham; near Hexham, Northumberland; Achosragan Hill, Appin, Argyll; Ben Lawers, Perthshire; Letter Hill, Connemara, Galway.

Form **meiosporiza** Leight. Lich. Fl. ed. 3, p. 294 (1879).—Thallus whitish or greyish-white, rimoso-diffract. Apothecia plane or subconvex, cæsio-pruinose.—*L. grisella* f. *meiosporiza* Nyl. in Flora lix. p. 239 (1876); Cromb. in Journ. Bot. xiv. p. 362 (1876).

Exsicc. Johns. n. 352.

Differs merely in the constantly paler thallus and the pruinose apothecia. As the name indicates, it has somewhat the aspect of *L. meiospora* Nyl. but with pruinose apothecia.

Hab. On schistose rocks in mountainous districts.—*Distr.* Local and scarce in N. England, the N. Grampians, Scotland, and in W. Ireland; no doubt to be detected elsewhere.—*B. M.* Alston, Cumberland; Morrone, Braemar, Aberdeenshire; near Letterfrack, Connemara, Galway.

Var. γ **Mosigii** Nyl. Lich. Scand. p. 230 (1861).—Thallus chestnut- or greyish-brown, smoothish. Apothecia moderate or somewhat large, innate, plane, thinly margined, pruinose, the margin often flexuose and naked.—f. *Mosigii* Leight. Lich. Fl. p. 288; ed. 3, p. 294; f. *deusta* Leight. Lich. Fl. p. 289; ed. 3, *l. c.* *L. fumosa* var. *Mosigii* Ach. Lich. Univ. p. 157 (1810); var. β *deusta* Mudd Man. p. 211 (1861) (non Fries).

Exsicc. Leight. n. 240 pro parte.

Differs chiefly in the pruinose apothecia which are either somewhat scattered or crowded and at times confluent. The thallus is limited by the hypothallus, which is also occasionally more or less visible between the areolæ.

Hab. On granitic and schistose rocks in maritime and mountainous districts.—*Distr.* Only here and there in Great Britain; rare in S. and W. Ireland (Connemara, Galway, *fide* Leight.); not found with certainty in the Channel Islands.—*B. M.* Roughton, Cornwall; N. Derbyshire; Dolgelly, Merioneth; The Wrekin, Shropshire; near Ayton, Cleveland, Yorkshire; Achosragan Hill, Appin, Argyll; Craig Calliach, Perthshire; near Portlethen, Kincardineshire; Morrone, Braemar, Aberdeenshire; near Bantry, Cork.

149. **L. nigrogrisea** Nyl. in Flora lxii. p. 357 (1879).—Thallus indeterminate, moderate or thinnish, granulate-areolate, greyish; the areolæ subconvex, somewhat shining (K−, CaCl−, medulla I−). Apothecia at first plane and thinly margined, then somewhat convex and almost immarginate, black; epithecium and perithecium blackish; hypothecium brown; spores ellipsoid-oblong, 0,007–11 mm. long, 0,004–5 mm. thick; hymenial gelatine bluish, the asci at length tawny-wine-coloured, with iodine.—Cromb. in Grevillea viii. p. 113.

Distinguished from all states of *L. fuscoatra* by the absence of any thalline reactions and the smaller spores. In the specimen seen, the apothecia are somewhat crowded. The spermogones, occasionally present, have the spermatia straight, 0,006–8 mm. long, 0,0006 mm. thick.

Hab. On a mica-schist wall in an upland district.—*B. M.* Craig Tulloch, Blair Athole, Perthshire (the only locality).

150. **L. macula** Tayl. in Mackay Fl. Hib. ii. p. 115 (1836); Nyl. in Flora lxii. p. 361 (1879).—Thallus determinate, thin, areolate-rimose, smooth, the areolæ minute, concave, then somewhat plane, more or less scattered, pale- or olive-greyish (K−, CaCl−); hypothallus very thin, black. Apothecia minute, innate, plane, margined, black, the margin slightly prominent; paraphyses concrete; epithecium bluish-brown; hypothecium brown; spores

oblong-ellipsoid, 0,006–8 mm. long, 0,003–4 mm. thick; hymenial gelatine pale-bluish then tawny-wine-red with iodine.—Cromb. in Journ. Bot. xx. p. 275 (1882). *L. perustula* Nyl. *l. c.* p. 221; Cromb. in Grevillea viii. p. 29. *L. nitida* Leight. Lich. Fl. ed. 3, p. 295 pro parte (non Schær.).

Exsicc. Leight. n. 278.

Resembles a diminutive state of *L. fuscoatra*, differing in the absence of any thalline reactions and the much smaller spores. The numerous inconspicuous apothecia occasionally have the margins paler.

Hab. On siliceous rocks in maritime and mountainous districts.—*Distr.* Only a very few localities in Wales and W. Ireland; probably overlooked elsewhere.—*B. M.* Barmouth, Merioneth; Llanberis, Carnarvonshire; Dunkerron, Kerry; Doughruagh Mt., Connemara, Galway.

151. **L. rivulosa** Ach. Meth. p. 38 (1803); Nyl. Lich. Scand. p. 222.—Thallus determinate, areolate-rimose or granulate-areolate, mouse-coloured, greyish-brown or pale-greyish (K−, CaCl−); hypothallus blackish, limiting and intersecting the thallus. Apothecia sessile, or adnate, somewhat plane, margined, slightly scabrid, brownish-black or black, the margin thin, flexuose, paler, paraphyses discrete, brown at the apices; hypothecium pale; spores ellipsoid or ellipsoid-oblong, slightly curved, 0,009–12 mm. long, 0,004–6 mm. thick; hymenial gelatine pale-bluish, the apices of the asci deep-blue then wine-red with iodine. —S. F. Gray Nat. Arr. i. p. 467; Hook. in Sm. Engl. Fl. v. p. 179; Tayl. in Mackay Fl. Hib. ii. p. 125; Mudd Man. p. 199 (excl. var.); Cromb. Lich. Brit. p. 79; Leight. Lich. Fl. p. 285; ed. 3, p. 291. *Lichen rivulosus* Sm. Engl. Bot. t. 1737 (1807).

Exsicc. Leight. n. 302; Mudd n. 168; Larb. Lich. Hb. n. 309; Johns. n. 353.

Easily recognized by the brownish-black hypothalline lines with which the thallus is usually intersected, and which suggested the trivial name. When the thallus is more granulose, the granules are depressed, plane, and either contiguous or discrete (f. *depressa* Leight. ed. 3, p. 291). Very rarely it is evanescent, the hypothallus and fructification only being visible (f. *depauperata* Leight. *l. c.*). The numerous though scattered apothecia are in moist situations often brownish-flesh-coloured, but become darker in the herbarium. The spermogones are frequent, verrucæform, scattered or confluent, with spermatia oblong, 0,003–4 mm. long, 0,001 mm. thick.

Hab. On rocks, chiefly granitic and quartzose, in maritime and mountainous districts.—*Distr.* Rather local, but plentiful where it occurs, in the Channel Islands, S., W. and N. England, Wales, Scotland and N.W. Ireland.—*B. M.* Sark and Guernsey; near Haytor, Dartmoor, Devon; Roscorla and Kymyal Cliff, Penzance, Cornwall; near Seaford, Sussex; Mynydd Gader, Dolgelly, Barmouth, and Cader Idris, Merioneth; Holyhead, Anglesea; Kildale Moor, Cleveland, Yorkshire; the Cheviots, Northumberland; Barcaldine and Appin, Argyll; Crianlarich, Ben Lawers, and Ben-y-gloe,

Perthshire; Nigg, Portlethen, and Cove, Kincardineshire; Morrone, Braemar, Aberdeenshire; Glen Nevis, Invernessshire; Kylemore, Connemara, Galway.

Form **obscurior** Cromb. in Leight. Lich. Fl. ed. 3, p. 291 (1879). — Thallus rimose-areolate, thinnish, brownish-black; hypothallus predominating. Apothecia sessile, somewhat small; otherwise as in the type.

The numerous and crowded hypothalline lines everywhere intersecting the thallus give it a concolorous aspect.

Hab. On quartzose rocks in mountainous regions.—*Distr.* Found only very sparingly in N. Wales and on the N. Grampians, Scotland. —*B. M.* Llyn Dinas near Beddgelert, Carnarvonshire; Morrone, Braemar, Aberdeenshire.

152. **L. Kochiana** Hepp Lich. Fl. Würz. p. 61 (1824); Nyl. Lich. Scand. p. 223.—Thallus determinate, smooth, rimose- or areolate-diffract, mouse-coloured or pale-greyish-brown; the areolæ plane or somewhat convex (K−, CaCl−); hypothallus black, limiting the thallus. Apothecia moderate or somewhat large, innate, plane, immarginate, often flexuose- or angulose-difform, black, dark within; paraphyses discrete; hypothecium thin, colourless; spores shortly ellipsoid or subglobose, 0,008–11 mm. long, 0,006–8 mm. thick; hymenial gelatine bluish, the apices of the asci at length wine-red, with iodine.—Cromb. Lich. Brit. p. 79; Leight. Lich. Fl. p. 281; ed. 3, p. 285. *L. rivulosa* var. *β Kochiana* Mudd Man. p. 199. *Biatora rivulosa* var. *Kochiana* Fr. Lich. Eur. p. 271 (1831).

Differs from the preceding mainly in the absence of intersecting hypothalline lines, in the darker, inner immarginate apothecia, and the more globose spores. It is a rather variable plant, according to the habitat, but presents only the following well-marked variety. The apothecia, which are even with the thallus, are in a very young state thinly margined, but the margin is speedily evanescent.

Hab. On rocks and boulders in mountainous regions.—*Distr.* Only here and there in Great Britain; not seen from Ireland or the Channel Islands.—*B. M.* Trellick, Monmouthshire; Cader Idris, Merioneth; Pen-y-gwryd, Snowdon, Carnarvonshire; Craig Rossie, The Ochils, and Ben-y-Gloe, Perthshire; Upper Glen Dee and Morrone, Braemar, Aberdeenshire; Hills of Applecross, Rossshire.

Var. **lygæa** Leight. Lich. Fl. p. 282 (1871).—Thallus dark, umber-brownish-coloured, effuse, continuous, smooth, slightly cracked-areolate. Apothecia smaller than in the type.—Leight. Lich. Fl. ed. 3, p. 286. *Lecidea lygæa* Ach. Syn. p. 34 (1814) excl. var.

Distinguished by the thinner and smoother thallus and by the minute apothecia. Occasionally the thallus is intersected and limited by the dark hypothallus and the apothecia are rather larger.

Hab. On rocks in maritime and mountainous regions.—*Distr.* Somewhat rare in the Channel Islands, Wales, the Grampians of

Scotland and W. Ireland; not recorded from England.—*B. M.* Boulay Bay, Jersey; Sark; Dolgelly; Barmouth and Cader Idris, Merioneth; Crianlarich, Perthshire; Doughruagh Mt. and Letterfrack, Galway.

153. **L. mollis** Nyl. Lich. Scand. p. 223 (1861).—Thallus determinate, minutely cracked-areolate, slightly furfuraceous on the surface, greyish or pale-brownish-grey (K −, CaCl −); hypothallus blackish, limiting the thallus. Apothecia rather small, superficial, with thickish entire margin, black or brownish-black, whitish within; paraphyses discrete, blackish-green at the apices; hypothecium colourless; spores shortly ellipsoid or subglobose, 0,007–8 mm. long, 0,005–6 mm. thick; hymenial gelatine pale-bluish, the asci at length wine-coloured, with iodine. —Leight. Lich. Fl. p. 277 pro minima parte; ed. 3, p. 280 pro parte. *L. rivulosa* var. *mollis* Wahlenb. Fl. Lapp. p. 472 (1812).

Hab. On quartzose rocks.—*B. M.* Morrone, Braemar, Aberdeenshire.

154. **L. pammicta** Stirton in Grevillea iii. p. 34 (1874).—Thallus whitish or greyish, thick, cracked-areolate, the areolæ minutely papillose (K+ yellow then orange-red). Apothecia black, sessile, plane or somewhat convex, with an undulate sometimes paler margin, the disc almost constantly gyrose-plicate; hypothecium colourless; paraphyses stout, coherent, with blackish clavate apices; spores ellipsoid, 0,008–10 mm. long, 0,005–6 mm. thick.—Leight. Lich. Fl. ed. 3, p. 283. Specimen not seen.

Hab. On rocks.

Collected by Dr. Stirton on Ben Arthur (The Cobbler), Argyll, and considered by him to be allied to *L. mollis* or *L. tessellata*, but distinguished by the chemical reaction of the thallus and other characters.

155. **L. interludens** Nyl. in Flora liii. p. 35 (1870).—Thallus determinate, thin, cracked-areolate, whitish or greyish-white (K+ tawny-yellow, CaCl −); the areolæ plane, minutely rugulose; hypothallus blackish. Apothecia superficial, somewhat convex, black, immarginate, or often plane with a very thin white epithalline margin, colourless within; paraphyses clavate and brownish at the apices; spores ellipsoid, 0,010–12 mm. long, 0,006–8 mm. thick; hymenial gelatine bluish, the asci wine- or violet-reddish, with iodine.—Cromb. in Journ. Linn. Soc. xi. p. 485 (1871); Leight. Lich. Fl. p. 287; ed. 3, p. 292.

Near *L. mollis*, but distinguished by the firmer thallus, its positive reaction with K, and especially by the form of the larger spores. The thallus is distinctly limited, and also here and there intersected by the hypothallus. The two specimens gathered are well fertile. The not uncommon spermogones have the spermatia somewhat short.

Hab. On a quartzose boulder in a subalpine locality.—*B. M.* Morrone, Braemar, Aberdeenshire (the only locality).

156. **L. coriacella** Nyl. in Flora lxv. p. 454 (1882).—Thallus effuse, thinnish or moderate, somewhat smooth, leathery, imbedded in the rock, greyish-black (K−, CaCl−). Apothecia submoderate, innate, opaque, immarginate, blackish, pale within; paraphyses moderate, the epithecium brown; hypothecium colourless; spores ellipsoid, 0,010–0,012 mm. long, 0,006 mm. thick; hymenial gelatine bluish, then tawny wine-red, with iodine.—Cromb. in Grevillea xii. p. 90. Specimen not seen.

Hab. On porphyritic rocks in an upland district in N.W. England (Red Screes, Westmoreland).

157. **L. periplaca** Nyl. in Flora lxv. p. 454 (1882).—Thallus determinate, thin or very thin, smoothish, thinly areolate-rimulose, greyish-black, subbyssoid and applanate-lobate at the circumference. Apothecia small, slightly margined, at length somewhat convex, black, pale within; paraphyses submoderate; epithecium and perithecium brown; hypothecium colourless; spores ellipsoid, obtuse at the apices, 0,009–0,010 mm. long, 0,006 mm. thick; hymenial gelatine bluish then deep yellow, the asci wine-reddish, with iodine.—Cromb. in Grevillea xii. p. 81. Specimen not seen.

Distinguished by the form of the thallus at the circumference, where it is very thinly or subobsoletely whitish-bordered. The spermogones, here and there visible, have the spermatia oblong, 0,003–4 mm. long, 0,0001 mm. thick.

Hab. On stones of a wall near Stavely, Kendal, Westmoreland.

158. **L. tenebrica** Nyl. in Flora lxv. p. 454 (1882).—Thallus subdeterminate, thinnish, unequal, areolate-rimose, dark-greyish (K−, CaCl). Apothecia rather small, convex, immarginate, black, within whitish; paraphyses not very well discrete; epithecium and lower stratum of the hypothecium brown; spores ellipsoid, 0,010–0,012 mm. long, 0,005–6 mm. thick; hymenial gelatine bluish then tawny-yellow with iodine. — Cromb. in Grevillea xii. p. 90. Specimen not seen.

Resembles *L. griseoatra*. The spermogones have the spermatia bacilliform, straight, 0,0035 mm. long, 0,0007 mm. thick.

Hab. On schistose rocks, Red Screes, Westmoreland.

159. **L. contenebricans** Nyl. in Flora lxvi. p. 533 (1883).—Thallus indeterminate, submoderate, smoothish, rimose-diffract, dark-greyish or greyish-brown, within white, (medulla I+K+ yellow, then rusty-red). Apothecia large, somewhat plane, margined, black, within whitish (the lower stratum dark-brown); epithecium bluish-black (NO_3 +violet-red); hypothecium reddish-brown; spores ellipsoid, 0,010–0011 mm. long, 0,005–6 mm. thick; hymenial gelatine bluish then tawny-violet, especially the asci, with iodine.—Cromb. in Grevillea xii. p. 90. Specimen not seen.

Distinguished from *L. tenebrica* by the larger margined apothecia and by the chemical reactions.

Hab. On schistose rocks, sparingly, Red Screes, Westmoreland.

160. **L. griseoatra** Schær. Enum. p. 101 (1850).—Thallus subdeterminate, thinnish or submoderate, somewhat smooth, opaque, rimose-areolate or areolate-granulose, dark- or pale-greyish or lead-coloured; the areolæ more or less tumid, crowded or dispersed (K ∓ yellowish, CaCl −, medulla I + reddish); hypothallus thin, black. Apothecia small, subinnate, at length partly prominent, at first depressed, then plane, at times convex, black, the margin thin, entire or obsolete; hypothecium thin, nearly colourless or brownish; paraphyses discrete, bluish-black at the apices; spores ellipsoid, 0,010–17 mm. long, 0,006–8 mm. thick; hymenial gelatine bluish then sordid, the asci tawny-wine-red, with iodine.—*L. tenebrosa* Flot. ex Nyl. in Act. Soc. Linn. Bord. ser 3, i. p. 373 (1856); Mudd Man. p. 204; Cromb. Lich. Brit. p. 85; Leight. Lich. Fl. p. 281; ed. 3, p. 283. *Verrucaria griseoatra* Hoffm. Deutschl. Fl. p. 182 (1795).

Exsicc. Leight. n. 188 (in some sets); Cromb. n. 185.

From its appearance this has been placed in *Lecanora*, near *L. cinerea*. The thallus is occasionally partly limited by the hypothallus, which is in young plants radiating. In our specimens the apothecia are usually numerous and not unfrequently abortive. The asci are cylindrical-clavate, somewhat lax, and with the paraphyses separate readily from the hypothecium. The spermogones, rarely present, have the spermatia short, straight, bacillar, 0,006–9 mm. long, about 0,001 mm. thick (*fide* Th. M. Fries Lich. Scand. p. 541).

Hab. On rocks in maritime and mountainous districts.—*Distr.* Local, though plentiful where it occurs in the Channel Islands, N. England and Wales, among the Grampians, Scotland; apparently rare in S.E. Ireland.—*B. M.* Noirmont, Jersey; Sark; Malvern Hills, Worcestershire; Cader Idris, Barmouth, and Dolgelly, Merioneth; Cwm Idwall, Nant Francon, Carnarvonshire; Windermere, Westmoreland; Cleveland, Yorkshire; Achosragan Hill, Appin, Argyll; Crianlarich, Ben Lawers, and Ben-y-gloe, Perthshire; Portlethen, Kincardineshire; Glen Callater and Morrone, Braemar, Aberdeenshire; Ben Nevis, Invernessshire; near Cork.

161. **L. fuscocinerea** Nyl. in Bot. Not. 1852, p. 177.—Thallus effuse rimose-areolate, unequal, greyish- or blackish-brown, the areolæ often warted and tuberculate (K −, CaCl −, medulla K + yellow); hypothallus blackish. Apothecia moderate, appressed or adnate, somewhat plane with thin prominent margin, usually thinly gyrose, variously flexuose or angulose, black; hypothecium brownish-black; paraphyses slender, concrete, dark-brown at the clavate apices; spores subglobose-ellipsoid, 0,010–14 mm. long, 0,007–9 mm. thick; hymenial gelatine pale-bluish then wine-red with iodine.—Leight. Lich. Fl. ed. 3, p. 285.

Subsequently referred by Nylander (Lich. Scand. p. 231) to *L. tenebrosa* Flot., which it resembles when the thallus is darker

and the apothecia regular. From its allies it may be recognized by the wrinkled (gyrophoroid) character of most of the apothecia. The not unfrequent spermogones have the spermatia shortly acicular, straight, 0,007–9 mm. long, about 0,001 mm. thick.

Hab. On schistose rocks and boulders in mountainous districts.—*Distr.* Only sparingly in N. Wales and on the Central Grampians, Scotland.—*B. M.* Ben Lawers and Ben Vrackie, Perthshire.

162. **L. atrofuscescens** Nyl. in Flora xlix. p. 371 (1866).—Thallus indeterminate, flattened, areolate-diffract, subopaque, greyish- or brownish-black (K−, CaCl−, medulla I + bluish); hypothallus black, only here and there visible. Apothecia adnate, plane, at length slightly convex, thinly margined, often subangulose, black; paraphyses slender, soft, somewhat irregular; epithecium brownish; hypothecium colourless or brownish; spores ellipsoid, 0,018–20 mm. long, 0,009–11 mm. thick; hymenial gelatine bluish then partly wine-red with iodine.—Cromb. Lich. Brit. p. 83; Leight. Lich. Fl. p. 286; ed. 3, p. 292.

Intermediate between *L. fuscoatra* and *L. griseoatra*, but readily distinguished from these and the allied species by the larger spores. The thallus generally spreads somewhat extensively over the substratum, though at times interruptedly when associated with other lichens. In our specimens the apothecia are numerous, crowded but distinct, and usually angulose. The spermogones, here and there visible, have the spermatia bacillar, 0,007–9 mm. long, 0,001 mm. thick (*fide* Nyl. in Flora lxx. p. 134 (1887)).

Hab. On rocks and boulders, schistose and greenstone, in upland situations.—*Distr.* Seen only from two localities in Scotland.—*B. M.* King's Park, Stirling; Ben Lawers, Perthshire.

163. **L. relicta** Stirton in Trans. Glasgow Soc. Nat. 1873, p. 89.—Thallus greyish-black, wrinkled, almost granular. Apothecia, black, small, adnate, plane, obtusely marginate becoming convex, immarginate and rugose; hypothecium brownish-black; paraphyses few, slender, distinct, the apices clavate, brown; spores oblong, 0,009–13 mm. long, 0,005–6 mm. thick; hymenial gelatine bluish then wine-red with iodine.—Leight. Lich. Fl. ed. 3, p. 277. Specimen not seen.

Hab. On rocks. Collected by Dr. Stirton at Blair Athole, Perthshire.

164. **L. uliginascens** Stirton in Scott. Nat. iv. p. 164 (1877).—Thallus brownish-black, minutely granular, effuse. Apothecia black, plane or subconvex (internally K + violet); hypothecium brownish-black; paraphyses few, irregular, slender; spores oblong, 0,010–13 mm. long, 0,006–7 mm. thick; hymenial gelatine pale-blue then dark-wine-red with iodine.—Leight. Lich. Fl. ed. 3, p. 278. Specimen not seen.

Hab. On turfy earth. Collected by Dr. Stirton near Garve, Rossshire.

165. **L. mullensis** Stirton in Scott. Nat. iv. p. 166 (1877).—Thallus dark or blackish-grey, areolate-warted, cracked, formed of erect columellæ, either connate or dispersed (K + yellow, medulla + yellow then ferruginous-red). Apothecia black, subinnate, small, plane, acutely margined, the margin often flexuose or undulate; hypothecium thickish, brown or brownish-black; paraphyses irregular, indistinct, black at the apices; spores ellipsoid, 0,006–9 mm. long, 0,004–6 mm. thick; hymenial gelatine bluish then wine-red with iodine.—Leight. Lich. Fl. ed. 3, p. 288. Specimen not seen.

Hab. On rocks. Collected by Dr. Stirton on rocks in Island of Mull.

166. **L. orphnæilla** Stirton in Scott. Nat. iv. p. 166 (1877).—Thallus black, opaque, minutely granular-furfuraceous, continuous. Apothecia black, sessile, plane or somewhat convex, with a shining, irregularly lobate margin; hypothecium colourless; paraphyses rather stout, generally conglutinate; the epithecium thick and black; spores oblong or fusiform-oblong, 0,013–18 mm. long, 0,003–4 mm. thick; hymenial gelatine intensely blue with iodine.—Leight. Lich. Fl. ed. 3, p. 254. Specimen not seen.

Hab. On rocks. Collected by Dr. Stirton in Island of Mull.

167. **L. phyllodisca** Stirton in Trans. Glasgow Soc. Nat. 1875, p. 86.—Thallus black, thin, scurfy or scarcely visible. Apothecia black, often 2–3 aggregate or conglomerate and then undulate, the margin thin, flexuose, shining dark-grey or dark-bluish-grey within (K + purpurescent or rosy); hypothecium blackish or darkly zonate; paraphyses distinct, clavate, and black or bluish-black at the apices; spores ellipsoid, 0,007–9 mm. long, 0,0045–55 mm. thick; hymenial gelatine slightly blue then wine-yellow or violet with iodine.—Leight. Lich. Fl. ed. 3, p. 353. Specimen not seen.

Hab. On rocks, rare. Collected by Dr. Stirton near Killiecrankie, Perthshire.

168. **L. callista** Stirton in Grevillea iii. p. 34 (1874).—Thallus dark-brownish-black, granular, the granules dispersed or conglomerate. Apothecia black, small, bluish-grey pruinose, sessile, crowded, often contiguous, the margin prominent, inflexed; hypothecium brownish-black, thin; paraphyses rather indistinct, thickish, clavate, and brown at the apices; spores ellipsoid or cylindrical, small, 0,012–14 mm. long, 0,003 mm. thick; hymenial gelatine intensely blue almost black with iodine.—Leight. Lich. Fl. ed. 3, p. 276. Specimen not seen.

Hab. On rocks. Collected by Dr. Stirton near Grantown, Invernessshire.

169. **L. aniptiza** Stirton in Trans. Glasgow Soc. Nat. 1875, p. 89.—Thallus blackish-grey or green, granular, thin. Apothecia black, small, prominent, convex, immarginate, papillose (as it were glomerate), entirely blackish-grey within; paraphyses irregular, indistinct, slender and branching; spores oblong-cylindrical, 0,007–11 mm. long, 0,0025–30 mm. thick; hymenial gelatine bright-blue with iodine.—Leight. Lich. Fl. ed. 3, p. 277. Specimen not seen.

Hab. On decorticated wood. Collected by Dr. Stirton near Killiecrankie, Perthshire.

170. **L. furvella** Nyl. in Mudd Man. p. 207 (1861).—Thallus effuse, thickish, granulose-furfuraceous, areolate-diffract, dark-olive-brown or blackish, opaque (K−, CaCl−); hypothallus blackish. Apothecia small, appressed, plane, wrinkled, margined, black, the margin thin, flexuose, persistent; paraphyses coherent, bluish-black at the apices; hypothecium dark-brown; spores ellipsoid, 0,012–17 mm. long, 0,006–8 mm. thick; hymenial gelatine bluish then wine-red with iodine.—Cromb. Lich. Brit. p. 84; Leight. Lich. Fl. p. 272; ed. 3, p. 272.

A well-marked species, having much the appearance of *Pannularia nigra*. The soft somewhat isidioid thallus is loosely adherent to the substratum. The more or less scattered apothecia are usually as if plicate, though here and there quite regular.

Hab. On schistose rocks and walls in mountainous regions.—*Distr.*—Local, though not unfrequent where it occurs, among the Grampians, Scotland.—*B. M.* Ben Lawers, Craig Tulloch, Glen Fender and Ben Vrackie, Perthshire; Morrone and Glen Callater, Braemar, Aberdeenshire.

171. **L. asperella** Stirton in Trans. Glasgow Soc. Nat. 1875, p. 87.—Thallus black, thickish, granular-furfuraceous cracked-areolate, determinate. Apothecia black, small, adnate, plane, margin thin, shining; hymenium in a thin section bluish-green; hypothecium colourless, subtended by a brownish-black excipulum; paraphyses not very distinct, the apices clavate, bluish; spores oblong-ellipsoid, 0,007–10 mm. long, 0,004–5 mm. thick; hymenial gelatine intensely and persistently blue with iodine.—Leight. Lich. Fl. ed. 3, p. 286. Specimen not seen.

Hab. On rocks. Collected by Dr. Stirton at Ben-y-gloe, Perthshire, and regarded by him as very closely allied to *L. furvella*.

172. **L. insularis** Nyl. in Bot. Not. 1852, p. 177.—Thallus determinate, verrucose-unequal, areolate-diffract, moderately thick; the areolæ verrucose-plicate, somewhat shining, brownish-grey or tawny-brown (K+ yellow, CaCl−); hypothallus blackish. Apothecia small, appressed, plane, black, margined, the margin thin, prominent, flexuose; paraphyses concrete, dark-brown at the apices; hypothecium brownish-black; spores ellipsoid, 0,010–12 mm. long, 0,005–6 mm. thick; hymenial gelatine bluish

then sordid-violet with iodine.—*L. intumescens* Nyl. in Act. Soc. Linn. Bord. ser. 3, i. p. 373 (1856); Mudd Man. p. 205, t. 3, f. 76; Cromb. Lich. Brit. p. 85; Leight. Lich. Fl. p. 254; ed. 3, p. 246. *L. badia* var. *β intumescens* Flot. Lich. Siles. n. 175 (1830).

Exsicc. Leight. n. 161; Mudd n. 174.

Distinguished by the manner and place of growth. With us it always forms small, orbicular, insulated patches on the thallus of *Lecanora glaucoma*, usually limited by the hypothallus. As noted by Mudd, though not strictly a parasite, it at length destroys the thallus of the plant upon which it germinates. In the specimens seen the apothecia are numerous and crowded.

Hab. On rocks in maritime and upland hilly districts.—*Distr.* Only here and there sparingly in Great Britain; not seen from Ireland or the Channel Islands.—*B. M.* Malvern Hills, Worcestershire; Gimlet Rock, Pwllheli, and Snowdon, Carnarvonshire; Caer Caradoc, Shropshire; Lounsdale and Cliffrigg, Cleveland, Yorkshire; near Portlethen, Kincardineshire.

173. **L. confusula** Nyl. in Flora lv. p. 360 (1872).—Thallus indeterminate, thinnish, granulate or granulate-conglomerate, the glomerules thin, scattered, olive-grey or greyish-brown (K−, CaCl−). Apothecia small, adnate, convex, immarginate, black, whitish within; hypothecium colourless; paraphyses concrete; epithecium yellowish-brown (K−); spores ellipsoid, 0,007–0,011 mm. long, 0,004–5 mm. thick; hymenial gelatine deep-blue then wine-red with iodine.—Cromb. in Grevillea l. p. 61; Leight. Lich. Fl. ed. 3, p. 266.

Hab. On micaceous rocks or on walls.—*B. M.* Craig Tulloch, Blair Athole, Perthshire (the only locality).

174. **L. nigrificans** Nyl. in Flora lix. p. 307 (1876).—Thallus effuse, thin, rugulose, areolate-rimose, opaque, blackish, internally green (K−). Apothecia small, subprominent, plane, slightly margined, black, the margin at times bluish-grey, suffused; hypothecium colourless; paraphyses distinct, moderate; epithecium blackish-blue-green; spores ellipsoid, 0,011–12 mm. long, 0,006–7 mm. thick; hymenial gelatine wine-red with iodine.—Cromb. in Grevillea v. p. 27; Leight. Lich. Fl. ed. 3, p. 292.

Distinguished from the preceding by the colours of the thallus and the occasionally suffused margins of the apothecia, which in the specimen seen are subminute and numerous.

Hab. On a schistose rock in a maritime district.—*B. M.* Killery Bay, Connemara, Galway (the only locality).

175. **L. leiotea** Nyl. in Flora l. p. 328 (1867).—Thallus determinate, thin, continuous, smooth, obsoletely rimulose, shiny-brown or greyish-black. Apothecia submoderate, adnate, plane, margined, black, the margin obtuse or indistinct; hypothecium colourless; paraphyses moderate, thicker and brownish at the

apices, and there usually separate; spores ellipsoid, 0,008–11 mm. long, 0,006–7 mm. thick; hymenial gelatine pale-bluish with iodine.—Cromb. Lich. Brit. p. 85; Leight. Lich. Fl. p. 291; ed. 3, p. 297.

The thallus is sometimes mucose-gelatinous, resulting probably from the habitat. In our specimens the apothecia are somewhat scattered. The spermogones are frequent, with simple, short sterigmata and ellipsoid, oblong spermatia, about 0,004 mm. long, 0,0015 mm. thick.

Hab. On shady rocks in mountainous districts.—*Distr.* Local and scarce in N. Wales and S.W. Ireland.—*B. M.* Trefriw Falls, Denbighshire; Croghan, Killarney, Kerry.

176. **L. alienata** Nyl. in Flora lxii. p. 362 (1879).—Thallus effuse, somewhat granular or leprose, unequal, thin, scattered, greyish-yellow (Kf + yellowish, K(CaCl) + pale-tawny-reddish). Apothecia minute, prominent, thinly margined, glomerulose-connate, black; paraphyses moderate, pale-bluish at the apices; hypothecium blackish; spores ellipsoid, 0,012–15 mm. long, 0,007–8 mm. thick; hymenial gelatine scarcely tinged, but the asci bluish then tawny, with iodine.—*Lithographa Larbalestierii* Leight. Lich. Fl. ed. 3, p. 394 (1879).

Exsicc. Larb. Lich. Hb. n. 153.

From its graphideine aspect referred by Leighton to *Lithographa*. In the absence of spermogones its systematic place is doubtful. The fructification constitutes irregular, scattered glomerules, each of which is composed of 12 or more apothecia. The gonidia are either simple or subglomerulose.

Hab. On moist schistose rocks.—*B. M.* Kylemore Lake, Galway.

177. **L. advertens** Nyl. in Flora xlix. p. 419 (1866).—Thallus indeterminate, thin, subfurfuraceous, byssoid, olive-black (K−, CaCl−). Apothecia minute, at length somewhat convex and immarginate, black; paraphyses concrete; epithecium sordid-bluish; hypothecium black or brownish-black; spores ellipsoid, 0,011–14 mm. long, 0,007–9 mm. thick; hymenial gelatine bluish with iodine.—Leight. in Ann. Mag. Nat. Hist. ser. 3, ix. p. 468 (1867) & Lich. Fl. p. 255; ed. 3, p. 251; Cromb. Lich. Brit. p. 86.

Associated with a cyanophyceous alga, and has the aspect externally of *Spilonema revertens*.

Hab. On calcareous rocks in maritime and subalpine tracts.—*Distr.* Found only in Wales and N. W. Ireland.—*B. M.* Giltar Point, Tenby, Pembrokeshire.

178. **L. segregans** Nyl. in Flora xlix. p. 372 (1866).—Thallus indeterminate, verrucose-granular, whitish or greyish-white, the granules more or less segregate, or here and there confluent; hypothallus blackish, usually little visible. Apothecia small, subplane, immarginate, at length convex, often aggregate-

confluent and then rather small, black; hypothecium brown; paraphyses not well discrete, spores oblong, 0,010–13 mm. long, 0,0035–45 mm. thick; hymenial gelatine pale-bluish then tawny-wine-coloured with iodine.—Leight. in Ann. Mag. Nat. Hist. ser. 3, xix. p. 332 (1867) & Lich. Fl. p. 282; ed. 3, p. 286; Cromb. Lich. Brit. p. 92. Specimen not seen.

Nylander places this near *L. melancheima* Tuck. though in the absence of the spermogones, its position is uncertain.

Hab. On a mica-schist rock.—*Distr.* Ben Lawers, Perthshire.

179. **L. neglecta** Nyl. in Not. Sällsk. Faun. & Fl. Fenn. iv. p. 233 (1859) & Lich. Scand. p. 244.—Thallus subdeterminate, thinly granulose, greyish-white or leaden-greyish, the granules minute, subconfluent in patches (K+ yellow, CaCl−). Apothecia minute, superficial, somewhat plane, black, opaque, the margin obtuse, at length evanescent; paraphyses dark-brownish at the apices; hypothecium brownish or dark; spores oblong or fusiform-oblong, 0,008–11 mm. long, 0,003–4 mm. thick; hymenial gelatine not tinged or only sordid-yellow with iodine.—Cromb. in Journ. Bot. xiii. p. 141 (1875); Leight. Lich. Fl. ed. 3, p. 276.

Exsicc. Cromb. n. 189.

A very distinct and rather peculiar species, which in a sterile condition might readily be taken for a rudimentary condition of a *Stereocaulon*. The thallus, normally orbicular, becomes, through the confluence of several, more or less effuse. Apothecia rare.

Hab. Incrusting mosses (Grimmias and Andreæas) on boulders in a subalpine district.—*Distr.* Local and scarce on the S. Grampians, Scotland, and in N. England.—*B. M.* Ben Lawers, Perthshire.

180. **L. obsoleta** Nyl. in Flora xlviii. p. 604 (1865).—Thallus not visible. Apothecia minute, opaque, black, concolorous within, the margin obtuse or indistinct; paraphyses discrete, the apices subclavate, thickened, nearly colourless; hypothecium sordid brownish; spores oblong, sometimes obsoletely septate, 0,009–11 mm. long, 0,003 mm. thick; hymenial gelatine scarcely tinged with iodine.—Leight. in Ann. Mag. Nat. Hist. ser. 3, xvii. p. 350 (1866) & Lich. Fl. p. 299; ed. 3, p. 309; Cromb. Lich. Brit., p. 92. Specimen not seen.

Differs from the preceding in the absence of a proper thallus and in the character of the paraphyses.

Hab. On cretaceous soil in an upland situation.—*Distr.* The Downs, near Lewes, Sussex.

181. **L. pedatula** Nyl. in Flora lix. p. 236 (1876).—Thallus effuse, thin, granulose, whitish (K + yellow). Apothecia minute, somewhat convex, stipitate, immarginate, black; hymenium in thin section bluish, the epithecium darker; hypothecium stipitiform, reddish; spores not seen fully developed; hymenial

gelatine slightly bluish with iodine.—Cromb. in Grevillea v. p. 28; Leight. Lich. Fl. ed. 3, p. 276. Specimen not seen.

Hab. On rocks, overspreading *Sirosiphon saxicola.*—*Distr.* Extremely local and rare, known only from a single specimen (Connemara, Galway).

182. **L. sylvicola** Flot. Lich. Siles. n. 171 (1830); Nyl. in Not. Sällsk Faun. & Fl. Fenn. n. ser. v. p. 185 (1866).—Thallus effuse, thin, rimulose, wrinkled or somewhat furfuraceous, pale-tawny-yellow or dull-greyish (K−, CaCl−). Apothecia small, black, convex, immarginate, sometimes becoming two or more connate and tuberculate; hypothecium thick, blackish-brown or violet-black; paraphyses concrete, the base and towards the tips deep-greenish-blue or sometimes brownish, the whole hymenium bluish; spores ellipsoid, small, 0,007–10 mm. long, 0,0035–45 mm. thick; hymenial gelatine wine-red with iodine.—Cromb. Lich. Brit. p. 69; Leight. Lich. Fl. p. 256; ed. 3, p. 248. *L. latens* Tayl. in Mackay Fl. Hib. ii. p. 259.

Exsicc. Larb. Lich. Hb. n. 304; Lich. Cæsar. n. 84.

In more exposed situations the thallus is somewhat variable in thickness and becomes darker in colour. The spermogones are wart-like with slender straight spermatia, 0,004–5 mm. long, about 0,001 mm. thick.

Hab. On shady rocks, granitic and schistose, in maritime and upland situations.—*Distr.* Rather local and scarce in the Channel Islands, W. England, S.E. and W. Ireland; not yet seen from Scotland.—*B. M.* St. Peter's Valley, Jersey; Moulin Bay, Sark; Cobo Bay, Guernsey; near Penzance, Cornwall; Holly Bush Hill, Malvern, Worcestershire; Barmouth, Merioneth; Battersby Bank, Cleveland, Yorkshire; the Dargle, Wicklow; Kylemore, Connemara, Galway.

Var. **infidula** Cromb. Lich. Brit. p. 69 (1870). Very similar to the type in external appearance, but with more pallid apothecia, and the hypothecium pallid or almost colourless.—Leight. Lich. Fl. p. 256; ed. 3, p. 248. *L. aphana* Nyl. in Flora l. p. 327 (1867); Carroll in Journ. Bot. v. p. 256 (1867); Cromb. Lich. Brit. p. 84; Leight. Lich. Fl. p. 267; ed. 3, p. 265. *L. infidula* Nyl. in Flora li. p. 278 (1868). *L. lutulata* Nyl. in Flora lvi. p. 297 (1873); Leight. Lich. Fl. ed. 3, p. 253. *L. dilutiuscula* Nyl. in Flora lix. p. 308 (1876) & Lich. Env. Paris, p. 93; Leight. Lich. Fl. ed. 3, p. 254.

Exsicc. Larb. Lich. Hb. n. 305.

Differs from the type in the paler-coloured hypothecium and in the more pronounced blue colour of the hymenium. Original specimens of *L. lutulata* from the type locality have the hypothecium pale, not brownish-black as described by Nylander.

Hab. On schistose and granitic rocks in maritime and upland districts.—*Distr.* Somewhat rare, though widely distributed, in the Channel Islands, S. and N. England and Wales, not recorded from Scotland.—*B. M.* Royal Manor Avenue and Rozel Meadow, Jersey;

near Shanklin, I. of Wight; Ditchen Cove and near Buckfastleigh, Devon; Gart and near Dolgelly, Merioneth; Builth, Brecknockshire; Battersby Bank, Cleveland, Yorkshire; Turk Lake, Killarney, Kerry; Twelve Pins, Connemara, Galway; Killree, Clare.

Var. *β* **Hellbomii** Leight. Lich. Fl. ed. 3, p. 249 (1879).—Thallus dark-greyish-brown. Apothecia globose-tuberculate, conglomerate, and spores somewhat smaller, 0,005–7 mm. long, 0,003–4 mm. thick, otherwise as in the type.—*Lecidea Hellbomii* Lahm in Flora liii. p. 177 (1870). *L. aggerata* Mudd Man. p. 208 (1861); Cromb. Lich. Brit. p. 77. *L. contigua* var. *aggerata* Leight. Lich. Fl. p. 294 (1871); ed. 3, p. 301.

Exsicc. Mudd n. 175.

Differs in the form of the somewhat scattered conglomerate apothecia, which resemble minute bramble fruit.

Hab. On rocks in maritime and mountainous districts.—*Distr.* Seen only from the Channel Islands, N. Wales and N. England.—*B. M.* Sark; Nant Gwynant, Snowdon, Carnarvonshire; Battersby Bank, Cleveland, Yorkshire.

183. **L. aphanoides** Nyl. in Flora li. p. 476 (1868).—Thallus indeterminate, thin, subverrucose or subgranulose-unequal, dark-olive-grey. Apothecia small, convex, immarginate, naked, black; paraphyses concrete; epithecium and hymenium dark-greenish-blue; hypothecium slightly reddish beneath; spores ellipsoid, 0,009–13 mm. long, 0,0045–55 mm. thick; hymenial gelatine bluish then violet-red with iodine.—Cromb. in Journ. Bot. vii. p. 107 (1869) & Lich. Brit. p. 84; Leight. Lich. Fl. p. 267; ed. 3, p. 265.

In the single known specimen the apothecia are numerous and approximate, though not crowded.

Hab. On a calcareous boulder in a subalpine locality.—*B. M.* Near the summit of Craig Guie, Braemar, Aberdeenshire (the only locality).

184. **L. melaphana** Nyl. in Flora lii. p. 83 (1869).—Thallus subeffuse, thin, opaque, somewhat diffract, unequal, blackish (K−, CaCl−). Apothecia small, convex, immarginate, black; paraphyses somewhat lax, slightly clavate; epithecium (and the hymenium above) bluish-green; hypothecium thickish, brown beneath; spores oblong, 0,011–19 mm. long, 0,0045–55 mm. thick; hymenial gelatine bluish then partly violet-coloured with iodine.—Cromb. in Journ. Bot. vii. p. 107 (1869) & Lich. Brit. p. 84; Leight. Lich. Fl. p. 297; ed. 3, p. 306.

Intimately related to *L. aphanoides*, from which it is distinguished by the darker colour of the hypothecium and by the longer spores. The single specimen, which is only sparingly fertile, was associated with *Lecanora smaragdula* f. *sinopica* and with *Lecidea contigua* var. *flavicunda*, the latter of which it partially overruns.

Hab. On a granitic boulder in an upland tract of a mountainous district.—*B. M.* Craig Guie, Braemar, Aberdeenshire (the only locality).

185. **L. expansa** Nyl. ex Mudd Man. p. 208 (1861).—Thallus effuse, thin, furfuraceous, continuous or rimulose, black or sordid-greyish (K−, CaCl−). Apothecia minute, sessile, plane, margined, black, the margin thin, smooth; hypothecium dark-brown; paraphyses concrete, blackish-brown at the apices; spores ellipsoid, minute, 0,007–10 mm. long, 0,0035–40 mm. thick; hymenial gelatine bluish with iodine.—*L. dispansa* Nyl. in Flora xlix. p. 87 (1866); Cromb. Lich. Brit. p. 84; Leight. Lich. Fl. p. 256; ed. 3, p. 248.

Exsicc. Leight. n. 186; Mudd n. 176; Larb. Lich. Hb. n. 222.

The thallus when black and little developed forms ink-like stains on the substratum. The apothecia, though very numerous, are scattered and solitary. The very minute spermogones are frequent, with cylindrical or subellipsoid spermatia, 0,003–4 mm. long, 0,0015 mm. thick.

Hab. On rocks and flint stones in maritime and upland situations. —*Distr.* Only here and there in England and Wales, Ireland and the Channel Islands; not seen from Scotland.—*B. M.* Rozel, Jersey; Lydd Beach, Kent; Thetford, Norfolk; Bewdley, Worcestershire; Stiperstones, Shropshire; near Battersby and Roseberry, Cleveland, Yorkshire; Teesdale, Durham; Glencorbot, Connemara, Galway.

Subsp. **demarginata** Nyl. in Flora lxi. p. 245 (1878).—Thallus very thin, subleprose, whitish or greyish. Apothecia convex, the margin indistinct, otherwise as in the species.—Cromb. in Grevillea vii. p. 97; Leight. Lich. Fl. ed. 3, p. 248.

In the single specimen seen, which is well fertile, the thallus is partly subochraceous.

Hab. On schistose rocks in a maritime district.—*B. M.* Salrock Road, near Kylemore, Connemara, Galway (the only locality).

186. **L. antiloga** Stirton in Scott. Nat. iv. p. 164 (1877).—Thallus nearly evanescent. Apothecia black, minute, adnate, plane, margin somewhat shining; hypothecium colourless, darker upwards; paraphyses very indistinct, the epithecium blackish or greenish-black; spores spherical, minute, 0,004–55 mm. broad; hymenial gelatine blue then dark violet.—Leight. Lich. Fl. ed. 3, p. 309. Specimen not seen.

Hab. On decorticated wood. Collected by Dr. Stirton at Aviemore, Elgin.

187. **L. enclitica** Nyl. in Flora xlix. p. 369 (1866) & in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. p. 148 (1866).—Thallus scarcely visible, evanescent or obsolete. Apothecia minute, convex, immarginate, black, dark within; hypothecium brown; paraphyses concrete; epithecium vaguely blackish; spores oblong, 0,008–14 mm. long, 0,003–4 mm. thick; hymenial gelatine bluish then sordid-wine-coloured with iodine.—Cromb. in Grevillea i. p. 172; Leight. Lich. Fl. p. 301; ed. 3, p. 311.

Resembles externally *Biatorina globulosa*, for an athalline state of which it might readily be taken, but is well distinguished by the colour of the apothecia internally and of the hypothecium, and also by the simple somewhat thicker spores. In one of the two British specimens there are faint traces of a greyish-white thallus. The apothecia are distantly scattered over the substratum, so that the plant is apt to be overlooked.

Hab. On old fir palings in a subalpine district.—*Distr.* Found only very sparingly among the central Grampians, Scotland.—*B. M.* Pass of Killiecrankie and Glen Fender, Blair Athole, Perthshire.

188. **L. nigroclavata** Nyl. in Bot. Not. p. 160 (1853).—Thallus effuse, very thin, greyish-brown or evanescent (K−, CaCl−). Apothecia small, superficial, at first plane and thinly margined, at length convex and immarginate, blackish-brown; hypothecium brownish or colourless; paraphyses thick, clavate or almost globose and dark-brown at the apices; spores oblong-cylindrical, 0,008–10 mm. long, 0,002–4 mm. thick; hymenial gelatine bluish with iodine.—*L. lenticularis* subsp. *nigroclavata* Cromb. Lich. Brit. p. 91; var. *nigroclavata* Leight. Lich. Fl. p. 316; ed. 3, p. 336. *L. baliola* Nyl. in Flora lix. p. 308 (1876); Cromb. in Grevillea v. p. 27. *L. spodoplaca* Nyl. in Flora lx. p. 567 (1877); Cromb. in Grevillea vi. p. 115; Leight. Lich. Fl. ed. 3, p. 307.

Exsicc. Larb. Lich. Hb. n. 228.

Considered by Nylander to be closely allied to *Biatorina lenticularis*, which it strongly resembles in the internal appearance of the apothecium and especially in the nigro-clavate paraphyses. *L. baliola* and *L. spodoplaca* are saxicolous forms; the former has the thallus tinged with peroxide of iron, and has been found associated with *Lecanora lacustris;* the latter is greyish though sometimes greenish (f. *viridicascens* Nyl. *l. c.*). On wood the thallus is hypophlœodal, the gonidia being situated beneath the surface of the substratum.

Hab. On the trunks of old trees or palings in S. England and S. Ireland; on moist maritime rocks in W. Ireland.—*B. M.* Lignicolous: Shanklin, I. of Wight; Lehenagh, near Cork, Limerick, Clare. Saxicolous: Derryclare, Killery Bay and Kylemore Lake, Connemara, Galway.

189. **L. xanthococca** Sommerf. Suppl. Fl. Lapp. p. 154 (1826); Nyl. Lich. Scand. p. 243.—Thallus effuse, thinnish, granulose or verrucose, the granules often more or less scattered, convex or somewhat depressed, straw-coloured or pale-yellow (K + yellow-ochraceous, CaCl −). Apothecia small, adnate or appressed, plane, often scabrid, margined, black, concolorous within, the margin thin, at times flexuose; paraphyses slender, blackish at the apices; epithecium K + purplish; hypothecium black; spores ellipsoid, 0,008–0,010 mm. long, 0,004–5 mm. thick; hymenial gelatine, especially the asci, deep-blue with iodine.

The thallus, as noted by Th. Fries (Lich. Scand. p. 517), is at first immersed and scattered, then erumpent, soft, with the verrucæ

either crowded and variously angulose or thin granulose and scattered, while at times it is subevanescent. The single British specimen is well fertile, though the thallus is for the most part but little developed. The spermogones are large, black, subglobose and variously corrugate, with spermatia shortly cylindrical, about 0,003 mm. long.

Hab. On the stump of an old fir tree in a wooded mountainous region.—*B. M.* Ballochbuie Forest, Braemar, Aberdeenshire.

190. **L. pycnocarpa** Koerb. Parerg. Lich. p. 213 (1861).—Thallus warted or warted-areolate whitish or dark-ashy-grey; hypothallus indistinct (K + yellow, CaCl −). Apothecia minute, black, somewhat convex, immarginate, conglomerate in dense orbicular groups; hypothecium dark-brown; paraphyses coherent, dark-brown towards the apices; spores linear-oblong 0,012–17 mm. long, 0,003–6 mm. thick; hymenial gelatine and asci blue then wine-red with iodine.—*L. symphorella* Nyl. in Flora lxiii. p. 35 (1870); Cromb. in Journ. Bot. viii. p. 98 (1870); Leight. Lich. Fl. p. 301; ed. 3, p. 286. *L. amphotera* Leight. ex Cromb. in Journ. Bot. ix. p. 179 (1871) & Lich. Fl. p. 183; ed. 3, p. 287.

Hab. On granitic and sandstone rocks.—*Distr.* Rare in mountainous places, N. Scotland.—*B. M.* Ben Lawers, Craig Tulloch, Ben-y-Gloe, Blair Athole, Perthshire; Morrone, Braemar and Hill of Ardo, Aberdeenshire.

191. **L. assimilis** Th. Fr. Lich. Scand. p. 556 (1874).—Thallus rather thin, areolate-warted or conglomerate, brownish-fawn-coloured or sordid (K −, CaCl −). Apothecia minute, sessile or adnate, at first concave with a prominent margin, becoming plane or slightly convex; hypothecium colourless; paraphyses slender, involved in gelatine, towards the tips a clear greenish-blue colour; spores ellipsoid, with a thin epispore, 0,011–13 mm. long, 0,005–7 mm. thick; hymenial gelatine deep blue with iodine.

In our specimens the spores are somewhat smaller than the size given by Th. Fries, measuring from 0,008 × 4 mm. upwards. The beautiful blue colour of the epithecium is very marked.

Hab. On rocks.—*B. M.* Ben Lawers, Perthshire.

192. **L. commaculans** Nyl. in Flora li. p. 476 (1868).—Thallus effuse, thin, opaque, subareolate, the areolæ scattered, depressed, greyish- or brownish-black (K −, CaCl −). Apothecia submoderate, slightly convex, scarcely margined, black, concolorous within; paraphyses concrete; epithecium blackish; hypothecium thickish, reddish-brown, the colour passing into the hymenium; spores oblong, 0,008–11 mm. long, 0,003–4 mm. thick; hymenial gelatine bluish with iodine.—Cromb. in Journ. Bot. vii. p. 106 (1869) & Lich. Brit. p. 93; Leight. Lich. Fl. p. 282; ed. 3, p. 287.

Approaches *L. kajanita* Nyl., a Scandinavian plant, but differs in the form of the spores and especially in the colour of the hypothecium.

From *L. expansa* Nyl. it is similarly separated by the hypothecium and also by the larger immarginate apothecia; these, like the thallus itself, are rather scattered. The spermogones, here and there visible, have the spermatia cylindrical, straight, 0,009–0,011 mm. long, 0,001 mm. thick.

Hab. On a felspathic boulder and quartzose stones in an alpine situation.—*B. M.* Summit of Morrone, Braemar, Aberdeenshire (the only locality).

193. **L. nitescens** Leight. in Grevillea iv. p. 79 (1875).—Thallus white, thin, continuous, minutely and irregularly rimulose, effuse, indeterminate (K + yellow, CaCl + yellow) often overspread more or less with a dark-brown alga. Apothecia numerous, small, somewhat convex, shining, immarginate; hypothecium thick, black; paraphyses distinct, but conglutinate, apices pale; spores oblong or linear-oblong, 0,017 mm. long, 0,0055 mm. thick.—Leight. Lich. Fl. ed. 3, p. 306. Specimen not seen.

Hab. On rocks. Collected by Larbalestier at Salrock Road, Connemara, Galway.

194. **L. restricta** Stirton in Trans. Glasgow Soc. Nat. 1875, p. 88.—Thallus blackish-grey, wrinkled, thin. Apothecia black, adnate, small, plane, obtusely margined; hypothecium colourless; paraphyses distinct, filiform, thick, the epithecium brownish; asci saccate; spores ellipsoid, 0,013–17 mm. long, 0,008–10 mm. thick; hymenial gelatine blue then yellow with iodine.—Leight. Lich. Fl. ed. 3, p. 298. Specimen not seen.

Hab. On rocks. Collected by Dr. Stirton at Blair Athole, Perthshire.

195. **L. mucosa** Stirton in Scott. Nat. 1879, p. 17.—Thallus fulvous, gelatinous or evanescent. Apothecia fuscous or fuscous-black, somewhat plane, convex or almost spherical, small; hypothecium fuscous; paraphyses conglutinate, indistinct, apices colourless, not clavate; spores ellipsoid, 0,007–10 mm. long, 0,004–5 mm. thick; hymenial gelatine blue then dirty with iodine.—Leight. Lich. Fl. ed. 3, p. 545. Specimen not seen.

Hab. On decayed wood. Collected by Dr. Stirton near Ben Doran, Argyll.

196. **L. oxyspora** Nyl. in Act. Soc. Linn. Bord. ser. 3, i p. 391 (1856.)—Apothecia minute, plane or slightly convex black or brownish-black, immarginate, dark within; hypothecium brownish; paraphyses concrete; spores ellipsoid-fusiform, 0,014–20 mm. long, 0,005–7 mm. thick; hymenial gelatine, especially the asci, bluish with iodine.—Cromb. Lich. Brit. p. 92; Leight. Lich. Fl. p. 357; ed. 3, p. 384. *Abrothallus oxysporus* Tul. in

Ann. Sci. Nat. ser. 3, xvii. p. 116, t. 16, fig. 27 (1852); Lindsay in Microscop. Journ. v. t. 4, ff. 15, 16; Mudd Man. p. 225.

Exsicc. Leight. n. 281.

Hab. Parasitic on various *Parmeliæ*—e.g. *P. saxatilis* f. *furfuracea*, *P. conspersa* var. *stenophylla*, *P. fuliginosa*, in maritime and upland districts.—*Distr.* Rather local in S.W. England, Wales, the Highlands of Scotland, and S.W. Ireland; not seen from the Channel Islands.—*B. M.* Near Launceston, Cornwall; near Abergavenny, Monmouthshire; Barmouth and Dolgelly, Merioneth; Barcaldine and Appin, Argyll; Craig Calliach, Pass of Leny and Dunkeld, Perthshire; Portlethen, Kincardineshire; Morrone, Braemar, Aberdeenshire; Dunkerron, Kerry.

197. **L. cladoniaria** Nyl. in Mém. Soc. Cherb. v. p. 339 (1857).—Thallus absent. Apothecia minute, opaque, subconvex, slightly prominent, rugulose, black, internally dark or concolorous; paraphyses moderate; hypothecium slightly blackish beneath; spores oblong, 0,010 mm. long, 0,0035 mm. thick; hymenial gelatine bluish then sordid with iodine.—Cromb. Lich. Brit. p. 94; Leight. Lich. Fl. p. 358; ed. 3, p. 388. Specimen not seen.

In this country the apothecia are known to occur only on the thallus of *Cladonia bellidiflora*, though they were originally detected on that of *Cladina uncialis;* in both cases they give the host a deformed and verrucose-rugose aspect.

Hab. Parasitic on *Cladonia bellidiflora* in an upland situation. —*Distr.* Kelly's Glen, near Dublin.

198. **L. imponens** Leight. in Trans. Linn. Soc. ser. 2, i. p. 238, t. 32, figs. 7 & 8 (1876).—Thallus obsolete. Apothecia black, minute, numerous, scattered, plane or subconcave, the thin margin disappearing; hypothecium colourless; paraphyses stout, coherent, blackish at the apices; spores ellipsoid, 0,014–15 mm. long, 0,0055 mm. thick.

Hab. Parasitic on the thallus of *Lecanora polytropa*.—*B. M.* Fort Hill, near Fishguard, Pembrokeshire (the only locality).

199. **L. epiphorbia** Stirton in Grevillea ii. p. 108 (1873).—"Apothecia resemble externally and internally those of *L.* (*Buellia*) *parmeliarum*, except that the paraphyses are neither thickened nor darker-coloured at their apices. The spores are colourless, or present, in a few instances, a faint tinge of yellow, and the reaction on the hymenial gelatine by means of iodine shows a deep vinous red without any preceding cœrulescent tints, instead of being negative as in *L. parmeliarum*. This lichen bears the same relationship to *L. parmeliarum* that *L. solorinaria* does to *L. oxyspora*."—Leight. Lich. Fl. ed. 3, p. 388. Specimen not seen.

Crombie (Journ. Bot. xii. p. 148 (1874)) suggests that this may be *Biatorina Wallrothii*, but this is denied by Stirton (Grevillea iii. p. 25).

Hab. Parasitic on *Solorina bispora*. Collected by Dr. Stirton on Ben Lawers, Perthshire.

200. **L. insita** Stirton in Scott. Nat. 1879, p. 17.—Thallus none. Apothecia black, small, convex, immarginate, generally nearly spherical, internally rufescent; hypothecium reddish or reddish-black; paraphyses distinct, slender, filiform, reddish or almost colourless at the apices; spores 12–16 in the ascus, spherical; hymenial gelatine intense-blue then deep-wine-red with iodine.—Leight. Lich. Fl. ed. 3, p. 545. Specimen not seen.

Hab. Parasitic on *Peltidea aphthosa*. Collected by Dr. Stirton at Craig-na-Lochan, Scotland.

§ iv. MYCOBLASTUS Th. Fr. Lich. Scand. p. 479 (1874); Norm. in Nyt. Mag. Nat. vii. p. 250 (1852) as genus. (Pl. 8.)

Thallus crustaceous. Spores usually 1, rarely 2 or 3 in the ascus; spermogones with simple sterigmata and straight spermatia.

201. **L. sanguinaria** Ach. Meth. p. 39 (1803) & Lich. Univ. p. 170.—Thallus effuse, moderate or thickish, granulose-unequal or granulose-concrescent, greyish-white or whitish (K + yellow, CaCl−); medulla blood-red beneath the apothecia. Apothecia adnate, moderate or somewhat large, convex, immarginate, black, greyish within; paraphyses concrete, dark-bluish at the apices; hypothecium thin, pale or slightly dark; spores solitary, very large, with a broad epispore, 0,070–0,100 mm. long, 0,028–38 mm. thick; hymenial gelatine, especially the asci, deep-blue with iodine.—Hook. Fl. Scot. ii. p. 37; S. F. Gray Nat. Arr. i. p. 464; Hook. in Sm. Engl. Fl. v. p. 177; Tayl. in Mackay Fl. Hib. ii. p. 120; Cromb. Lich. Brit. p. 93; Leight. Lich. Fl. p. 365; ed. 3, p. 262. *Lichen sanguinarius* L. Sp. Pl. p. 1607 (1753); Huds. Fl. Angl. p. 442 pro parte; Lightf. Fl. Scot. ii. p. 803 pro parte; Engl. Bot. t. 155; With. Arr. ed. 3, iv. p. 6. *Megalospora sanguinaria* Massal. Ric. Lich. p. 106 (1852); Mudd Man. p. 213, t. 4, f. 79.

Exsicc. Bohl. n. 46; Leight. n. 307; Mudd n. 184; Cromb. n. 94.

Easily recognized by the blood-red colour of the medulla under the apothecia which at times is also visible elsewhere in the thallus, in which case it is form *polyerythrina* Nyl. ex Th. Fries Lich. Scand. p. 480. The thallus varies somewhat in thickness according to the nature of the substratum, and when muscicolous is usually rather thin. The apothecia are numerous, scattered or crowded, sometimes confluent and difform; in our specimens a few occasionally appear as if crowned by the well-developed thallus, showing a transition to var. *lecanoroidea* Nyl. Lich. Jap. p. 77. The not unfrequent spermogones are very minute, punctiform, black, with spermatia shortly acicular, 0,006–9 mm. long, 0,001 mm. thick.

Hab. On rocks, trunks of old trees, chiefly firs, rarely on old palings or encrusting mosses on boulders in hilly and mountainous districts.—*Distr.* Not uncommon in central and N. England, plentiful in Wales and the Highlands of Scotland; apparently rare in E. and S.W. Ireland.—*B. M.* Charnwood Forest, Leicestershire; Hay Park, Herefordshire; Cromford Moor, near Matlock, and Black Edge, near Buxton, Derbyshire; Cader Idris and Nannau, near Dolgelly, Merioneth; Craigforda, Shropshire; Ingleby Park, Cleveland, Yorkshire; Windermere, Westmoreland; Hedgehope, Northumberland; Roseneath, Dumbartonshire; Inverary and Head of Loch Awe, Argyll; Glen Falloch, Killin, Ben Lawers, Black Wood of Rannoch, Craig Vinean and Craig-y-Barns, Dunkeld, Perthshire; Hill of Ardo, near Aberdeen; Craig Coinnoch, Morrone, Glen Quoich and near the foot of Ben Macdhui, Aberdeenshire; Glen Nevis and Rothiemurchus Woods, Invernessshire; Lairg, Sutherland; Dublin Mts.; Turk Mt., Killarney, Kerry.

Form **microcarpa** Nyl. Lich. Scand. p. 246, fig. 10 (1861).—Thallus thin, granulose-subconcrescent. Apothecia small; spores 0,058–72 mm. long, 0,024–30 mm. thick.

Differs in the smaller apothecia and spores. In the single British specimen, which is sparingly fertile, a few of the confluent apothecia are erratic on the sterile thallus of *Cladonia coccifera*.

Hab. Incrusting mosses on boulders in a subalpine locality.—*B. M.* Craig Calliach, Perthshire.

Var. β **affinis** Nyl. in Mém. Soc. Cherb. v. p. 127 (1857).—Thallus and apothecia as in the type; medulla not coloured.—Leight. Lich. Fl. ed. 3, p. 263. *L. affinis* Schær. Enum. p. 132 (1850); Cromb. in Journ. Bot. xii. p. 149 (1874).

Nylander rightly considers this only a variety, the absence of colour in the medulla being the only distinguishing character.

Hab. On decayed mosses on the ground in an alpine locality.—*B. M.* Morrone, Braemar, Aberdeenshire.

Var. γ **melina** Nyl. in Ann. Sci. Nat. ser. 4, xix. p. 357 (1863).—Thallus thinnish, medulla colourless. Apothecia small; spores 2 in the ascus, 0,052–64 mm. long, 0,034–44 mm. thick.—Cromb. in Journ. Bot. xii. p. 149 (1874); Leight. Lich. Fl. ed. 3, p. 263. *L. didymospora* Stirton in Grevillea ii. p. 60 (1873). *Lichenoides tartareum tinctorium candidum, tuberculis atris* Dill. Hist. Musc. p. 128 t. 18, fig. 8 (1740). *Megalospora melina* Krempelh. ex Nyl. *l. c.*

Closely related to the preceding, of which, but for the 2-spored asci and the smaller spores, it might be regarded as only a form (see Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. p. 166).

Hab. On the trunks of firs in mountainous districts.—*Distr.* Very local and rare in N. Wales and the S. Grampians, Scotland.—*B. M.* Cader Idris, Merioneth; Ben Lawers, Perthshire.

202. **L. fucata** Stirton in Scott. Nat. 1879, p. 16.—Thallus cinereous, granulose or evanescent. Apothecia black, round or oblong, or somewhat irregular, convex and immarginate, internally

entirely of an intense-violet colour, scarcely changed by iodine (K + blue-greenish); hypothecium colourless; paraphyses distinct, thickish, irregular; spores 1–3 in the ascus, ellipsoid or oblong-ellipsoid, the epispore thick and pellucid, 0,032–48 mm. long, 0,015–22 mm. thick.—Leight. Lich. Fl. ed. 3, p. 545. Specimen not seen.

Hab. On decorticated wood. Collected by Dr. Stirton near Tyndrum, Perthshire.

72. **BIATORELLA** De Not. in Giorn. Bot. Ital. ii. p. 192 (1846); Massal. Ric. Lich. p. 130 (1852) emend. (Pl. 9.)

Thallus crustaceous, effuse or definite, rarely almost obsolete. Algal cells *Protococcus*. Apothecia light-coloured or dark and carbonaceous with proper margin only; asci many-spored, the spores minute, simple, colourless, oblong or spherical. Spermogones with ovoid or shortly cylindrical spermatia.

By a printer's error, which is pointed out by Massalongo, *l. c.*, the genus was published as 8-spored instead of ∞-spored, and was confined to lichens with a thin leprose thallus. It was emended by Massalongo to include those with a more developed thallus, and further emended by Th. Fries (Gen. Heterolich. p. 86 (1861) & Lich. Scand. p. 396). Both these writers, as also Mudd (Man. p. 191), include one or more of the species placed by Crombie in the section *Sarcogyne* of *Lecanora* (Part i. p. 151). Zahlbrückner (Engl. & Prantl. Pflanzenfamilien i. 1, p. 151) places the genus (including section *Sarcogyne*) in the Order *Acarosporaceæ*, along with other genera, either lecanorine or lecideine, that have similar many-spored asci and minute colourless spores.

1. **B. fossarum** Th. Fr. Lich. Scand. p. 397 (1874).—Thallus effuse, very thin, granulose or leprose, greyish or greenish (K−, CaCl−), at times evanescent. Apothecia moderate or somewhat large, adnate or appressed, convex, immarginate, reddish-flesh-coloured or bright saffron-red, whitish within; hypothecium pale; paraphyses discrete, slender, yellow at the apices; spores oblong or oblong-cylindrical, 0,006–12 mm. long, 0,003–4 mm. thick; hymenial gelatine deep-blue then dark with iodine.—*Lecidea fossarum* Duf. in Fr. Lich. Eur. p. 264 (1831); Leight. Lich. Fl. ed. 3, p. 383; Cromb. in Grevillea xxii. p. 59.

Externally subsimilar to *Lecidea vernalis*, but differing in the structure of the apothecia. In the few British specimens seen, the thallus is but little visible, and the apothecia are also smaller and less brightly-coloured than in specimens from southern Europe.

Hab. On mosses amongst rocks in an alpine situation.—*B. M.* Summit of Ben Lawers, Perthshire.

2. **B. ochrophora** Th. Fr. Lich. Scand. p. 399 (1874).—Thallus effuse, very thin, occurring in patches (K−, CaCl−), or usually obsolete. Apothecia small, convex, at length subglobose, immarginate, yellowish-pruinose, sordidly pale within; paraphyses

slender, discrete, often irregular; epithecium minutely granulose, yellow-ochraceous (K + rose-violet); hypothecium colourless; spores spherical, 0,0035–45 mm. in diameter; hymenial gelatine bluish with iodine.—*Lecidea ochrophora* Nyl. in Flora xlviii. p. 355 (1865); Carroll in Journ. Bot. vii. p. 100 (1868); Cromb. Lich. Brit. p. 75; Leight. Lich. Fl. p. 354; ed. 3, p. 383.

Distinguished amongst its allies by the ochrey-pulverulent apothecia, which are at times several aggregate; when the powdery surface is rubbed off they become brown.

Hab. Spreading over decayed mosses on trunks of trees in maritime and upland districts.—*Distr.* Very local and rare in the Channel Islands and S.W. Ireland.—*B. M.* Rozel, Jersey; Dinish, Killarney, Kerry.

3. **B. moriformis** Th. Fr. Lich. Scand. p. 401 (1874).—Thallus effuse, thinnish or thin, granulose-leprose, greyish or brownish grey (K + yellow, CaCl + red), often evanescent. Apothecia submoderate or small, sessile, somewhat plane or convex, immarginate, blackish or brownish-black, greyish within; paraphyses very slender, indistinct, the epithecium æruginous-green or dark-brownish olive; hypothecium colourless; asci tumid; spores globose, minute, 0,0025–35 mm. in diameter; hymenial gelatine deep-blue then dark with iodine.—*B. resinæ* var. *rubicundulæ* Mudd Man. p. 191 (1861). *Arthonia moriformis* Ach. Syn. p. 5 (1814). *Lecidea tantilla* Nyl. in Act. Soc. Linn. Bord. xxi. p. 363 (1856); Cromb. Lich. Brit. p. 76; Leight. Lich. Fl. p. 354; ed. 3, p. 382. *L. improvisa* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. iv. p. 233 (1859); Cromb. Lich. Brit. p. 76.

The thallus, greyish-green when moist, varies somewhat in thickness, and is often either almost absent or obliterated by other lichens associated with it; it usually spreads extensively over the substratum, especially when subevanescent. The apothecia are numerous, scattered or approximate, unequal, sometimes two together; when moistened, or when the plant grows in shady situations, they are reddish-brown. The epithecium varies in colour from æruginous-green to olive-brown or to a bright brown (described as *Sarcogyne pinicola* Massal. in Lotos 1856, p. 78; *Biatorella pinicola* Th. Fr. *l. c.*). Pycnidia occasionally occur, but they may not belong to the plant.

Hab. On old palings in lowland and upland tracts.—*Distr.* Somewhat plentiful throughout England, rare in Wales, not recorded from Scotland or Ireland.—*B. M.* Penshurst, Kent; Reigate, Surrey; Millhill, Middlesex; Spetchley, Whittington and Hindlip, Worcestershire; Stableford, Port Hill, near Shrewsbury, Neescliff, Wellington, Upton Magna and Bomere Pool, Shropshire; Nannau, Dolgelly, Merioneth; near Redcar and Stokesley, Cleveland, Yorkshire.

4. **B. resinæ** Th. Fr. Lich. Arct. p. 199 (1860).—Thallus effuse, very thin, leprose-granulose, greyish or greyish-green (K−, CaCl−), usually obsolete. Apothecia small or moderate, adnate, somewhat concave or plane, pale-yellowish-brown or

orange-red, the margin thin, pale, at length evanescent; paraphyses very slender, discrete, yellowish; hypothecium pale; spores globose, 0,0025–35 mm. in diameter; hymenial gelatine deep-blue with iodine.—Mudd Man. p. 191 (excl. var.). *Lecidea resinæ* Fr. Obs. Myc. i. p. 180 (1815); Nyl. in Act. Soc. Linn. Bord. ser. 3, i. p. 363; Cromb. Lich. Brit. p. 76; Leight. Lich. Fl. p. 354; ed. 3, p. 383 (excl. form) & in Grevillea i. p. 58, t. 4, f. 9. *Peziza resinæ* Fr. Syst. Myc. ii. p. 149 (1822); Cooke Handb. Brit. Fung. p. 706.

Exsicc. Leight. n. 277.

A plant variously referred by authors to Lichens or to Fungi. If the thallus, as described above, be proper, it belongs to the former as it contains gonidia. When the thallus is absent, often there is sparingly visible a soft fungoid mycelium, which would seem to indicate that it is a Peziza. It is retained here from its apparent affinity to other species of *Biatorella*. The spermogones, concolorous with the apothecia, sometimes occur by themselves, when they are known as *Sphæria resinæ* Fr.

Hab. On resinous bark and decorticated trunks of firs in hilly and mountainous districts.—*Distr.* Seen from only a few scattered localities in Great Britain; not recorded from Ireland.—*B. M.* Shiere, Surrey; Bettws-y-Coed, Carnarvonshire; Trefriw, Denbighshire; Cliffrigg, Cleveland, Yorkshire; Staveley, Westmoreland; Craig Calliach and Ben Lawers, Perthshire; Countesswells Woods, near Aberdeen; Rothiemurchus Woods, Invernessshire.

5. **B. difformis** Wainio in Helsingf. Faun. & Fl. Fenn. Medd. x. p. 143 (1883).—Thallus indistinct or absent (K−, CaCl−). Apothecia small, at first concave and thinly margined, becoming slightly convex and immarginate, black, opaque, concolorous within; paraphyses discrete; epithecium and hypothecium brown; spores globulose, 0,0020–25 mm. in diameter; hymenial gelatine and asci deep-blue with iodine.—*Peziza difformis* Fr. Syst. Mycol. ii. p. 151 (1823). *Lecidea difformis* Nyl. Peziz. Fenn. p. 68 (1868); Cromb. in Grevillea xxii. p. 59. *L. resinæ* f. *cicatricicola* Leight. in Grevillea i. p. 59, t. 4, f. 9, *c*, *e*, *g*, *k* (1872) & Lich. Fl. ed. 3, p. 383; Cromb. in Grevillea *l. c.*

Differs from the preceding in the colour of the apothecia and hypothecium and in the rather smaller spores. The thallus, described by Leighton as being brownish, greenish-brown, or purplish, is evidently foreign; it grows intermixed with *B. resinæ*. The spermogones, not unfrequent, are black.

Hab. On resinous bark of firs in upland wooded districts.—*Distr.* Seen from only two localities in England and Wales; no doubt to be detected elsewhere.—*B. M.* Shiere, Surrey; Bettws-y-Coed, Carnarvonshire.

6. **B. Morio** Mudd Man. p. 192 (1861) pro parte.—Thallus greyish-black, areolate, the areolæ blackish or yellowish-copper-coloured, plane, angular, somewhat shining, radiate-plicate at the circumference, hypothallus brownish-black. Apothecia minute,

black, innate, plane or often angular and umbonate, with a thin flexuose margin; hypothecium colourless or brownish; paraphyses discrete, bluish-green or dark-brown at the apices; spores spherical or subellipsoid, 0,003–4 mm. long, 0,002–3 mm. thick.—*Lecidea Morio* Fr. Lich. Eur. p. 319 (1831); Cromb. Lich. Brit. p. 84; Leight. Lich. Fl. p. 353; ed. 3, p. 382.

Has much the appearance of *Lecidea fuscoatra*.

Hab. On rocks.—*Distr.* Somewhat uncommon in maritime, or chiefly in alpine districts in England and Scotland, not recorded from Ireland.—*B. M.* Barmouth, near Dogelly, and Cader Idris, Merioneth; Yorkshire; Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire.

Var. **cinerea** Mudd *l. c.*—Thallus cracked-areolate, the areolæ crowded towards the centre, greyish-brown, less distinctly effigurate at the circumference. Otherwise as in the type.—*Lecidea Morio* var. *cinerea* Schær. Enum. p. 108 (1850). Specimen not seen.

Mudd cites Leighton's *Exsicc. L. fuscoatra* n. 304, but the specimen of this number in the British Museum belongs to *L. fuscoatra*.

Hab. On rocks.—*Distr.* Wales (Barmouth, Merioneth) and N. England.

73. **BIATORINA** Massal. Ric. Lich. p. 134 (1852) emend.; Mudd Man. p. 175 (1861). *Thalloidima* Massal. *l. c.* p. 95; Mudd Man. *l. c.* p. 172. *Catillaria* Massal. *l. c.* p. 78. (Pl. 10.)

Thallus minutely squamulose (*Thalloidima*), turgid or variously crustaceous, sometimes evanescent or wanting. Algal cells *Protococcus* or rarely *Trentepohlia*. Apothecia either light-coloured and biatorine (*Biatorina*) or black and lecideine (*Catillaria*), the proper margin often obliterated; spores usually 8 in the ascus, ellipsoid or oblong, usually 1-septate, colourless.

Massalongo described three genera, *Thalloidima*, *Catillaria* and *Biatorina*, which differ slightly in the form of the thallus and the texture of the apothecia, but are all characterized by the colourless usually 2-celled spores. Mudd united *Catillaria* and *Biatorina* under the latter, retaining *Thalloidima* as a separate genus.

1. **B. cœruleonigricans** A. L. Sm.—Thallus determinate, squamulose, usually bluish-grey-pruinose, pale-brown, glaucous or bluish-black (K−, CaCl−); squamules smooth, turgid-plicate in the centre, roundly lobed at the circumference. Apothecia sessile, moderate, plane or somewhat convex, bluish-black, bluish-grey-pruinose or naked, the margin thick, obtuse, occasionally flexuose, at length excluded; paraphyses dark-brown at the apices; hypothecium reddish- or dark-brown; spores subfusiform or subacicular, 0,018–30 mm. long, 0,002–4 mm. thick; hymenial gelatine bluish then wine-red with iodine.—*Lichenoides glaucum, squamis crassis, brevissimis* Dill. Hist. Musc. p. 228, t. 30, f. 135 (1740). *Lichen cœruleonigricans* Lightf. Fl. Scot. ii.

p. 805 (1777); With. Arr. ed. 3, iv. p. 10; Engl. Bot. t. 1139. *Patellaria vesicularis* Hoffm. Pl. Lich. ii. p. 30 (1794). *Lepidoma vesiculare* S. F. Gray Nat. Arr. i. p. 460 (1821). *Lecidea vesicularis* Hook. Fl. Scot. ii. p. 40 (1821); Cromb. Lich. Brit. p. 76; Leight. Lich. Fl. p. 313. *L. cæruleonigricans* Schær. Enum. p. 101 (1850); Tayl. in Mackay Fl. Hib. ii. p. 131; Leight. Lich. Fl. ed. 3, p. 330. *Psora cæruleonigricans* Hook. in Sm. Engl. Fl. v. p. 192 (1833). *Thalloidima vesiculare* Massal. Ric. Lich. p. 95 (1852); Mudd Man. p. 173, t. 3, f. 63.

Exsicc. Dicks. Hort. Sicc. n. 24; Bohl. n. 67; Leight. n. 335; Mudd n. 143; Larb. Cæsar. n. 34 & Lich. Hb. n. 230; Cromb. n. 179; Johns. n. 377.

Varying as to the colour and size of the thallus according to the nature of the habitat. The squamules are somewhat discrete or congested and either pruinose or naked or partly both. The apothecia, usually more or less scattered, are at times here and there confluent and occasionally rather large.

An apparently stunted condition, with the squamules conglomerate (f. *glebosa* Cromb. in Grevillea xxii. p. 59), has been found among mosses on rocks.

Hab. On the ground and in crevices of rocks, chiefly calcareous, in maritime and upland situations.—*Distr.* Not unfrequent and plentiful where it occurs, in Great Britain; apparently rare in E. Ireland and the Channel Islands.—*B. M.* Port Gorey, Sark; Quenvais, Jersey; near Ventnor, I. of Wight; Torquay, Devon; Bray Hill, St. Minver, Cornwall; Cleve Hill, Yatton and Bathford Hill, Somerset; Newhaven and Rottingdean, Sussex; near Bristol, Gloucestershire; Llangollen, Denbighshire; Thetford Warren, Norfolk; Gogmagog Hills, Cambridgeshire; Ashwood Dale, Buxton, Derbyshire; near Tenby, Pembrokeshire; Puffin Island, Anglesea; Great Orme's Head, Carnarvonshire; Oswestry and Llanymynech Hill, Shropshire; Stutton, Yorkshire; Teesdale, Durham; Inchkeith, near Edinburgh; near Appin House, Argyll; Ben Lawers and Craig Tulloch, Perthshire; Craig Guie, Braemar, Aberdeenshire; near Dublin; near Cork.

2. **B. candida** Jatta Syll. Lich. Ital. p. 372 (1900).—Thallus determinate, squamulose, white, densely white-suffused, the squamules tumid, plicate, congested and imbricate in the centre, lobed at the circumference, the lobes rarely subcrenate at the margins (K−, CaCl−). Apothecia appressed, moderate, plane or slightly convex, black, bluish-grey-pruinose, at length naked, the margin thickish, entire; hypothecium pale-reddish-brown; paraphyses subconcrete, dark-brown at the apices; spores fusiform or fusiform-acicular, 0,016–23 mm. long, 0,003–5 mm. thick; hymenial gelatine bluish then sordid-wine-red with iodine. —*Lichen candidus* Weber Spicil. Fl. Goett. p. 193 (1778). *Lecidea candida* Ach. Meth. p. 79 (1803); Cromb. Lich. Brit. p. 77; Leight. Lich. Fl. p. 313; ed. 3, p. 330. *Lepidoma candidum* S. F. Gray Nat. Arr. i. p. 460 (excl. syn. Engl. Bot.) (1821). *Thalloidima candidum* Massal. Ric. Lich. p. 96, fig. 197 (1852); Mudd Man. p. 172.

Intimately related to the preceding, for states of which it might readily be taken; it differs, however, chiefly in the more constantly and densely pruinose thallus, the more persistently margined apothecia, and the paler hypothecium. The apothecia, not numerous in our specimens, become in age angulose with the margin flexuose.

Hab. Incrusting mosses on calcareous rocks and on soil in their crevices in hilly and mountainous tracts.—*Distr.* Only a very few localities in England and Wales and on the S. Grampians, Scotland. —*B. M.* Torquay, Devon; Cleeve Hill, Yatton, Somersetshire; Ingleborough, Yorkshire; Great Orme's Head, Carnarvonshire; Isle of Man; summit of Craig Calliach, Head of Loch-na-Gat, and near the summit of Ben Lawers, Perthshire.

3. **B. tumidula** A. L. Sm.—Thallus subdeterminate, thickish, verrucose- or areolate-squamulose, the areolæ sublobate-plicate, turgid, wrinkled or cracked on the surface, white or glaucous-white (K−, CaCl−). Apothecia moderate, sessile on the margins of the areolæ, at first plane and thinly margined, then convex and immarginate, often confluent, black, naked, black within; hypothecium thick, reddish-black; spores oblong, indistinctly 1-septate 0,012 mm. long, 0,006 mm. thick; hymenial gelatine bluish with iodine.—*Lichen tumidulus* Sm. in Trans. Linn. Soc. i. p. 82, t. 4, f. 3 (1791). *L. mamillaris* Gouan Herb. Montp. p. 88 (1796). *Lecidea mamillaris* Duf. in Fr. Lich. Eur. p. 285 (1831); Carroll in Journ. Bot. iii. p. 290 (1865); Cromb. Lich. Brit. p. 77; Leight. Lich. Fl. p. 254; ed. 3, p. 245. *Thalloidima mamillare* Massal. Ric. Lich. p. 96, fig. 198 (1852); Mudd Man. p. 170.

Well characterized by the superficially wrinkled or subgyrose thallus. The squamules, usually crowded, are at times somewhat scattered; the spores are obscurely bilocular.

Hab. On the soil in crevices of sandy and calcareous rocks in maritime and upland districts.—*Distr.* Very local and scarce in S.W. and (*fide* Leighton) in central England (Dovedale, Derbyshire).—*B. M.* Babbicombe and Torquay, Devon; Cleeve Hill, Yatton, Somerset.

4. **B. cumulata** Th. Fr. Lich. Arct. p. 187 (1860).—Thallus effuse, thickish, unequal, warted or squamulose, the squamules small, crenate-lobed or radiating at the circumference, greyish (K+yellow, CaCl−); hypothallus black. Apothecia minute, plane, crowded, black or reddish-black, with a thin paler margin, at length evanescent; hypothecium pale-brownish, narrow, reddish-coloured in a thick section; paraphyses coherent, rather thickened and brown towards the apices; spores oblong or fusiform, usually 1-septate, sometimes simple or faintly 2-3-septate, 0,013–18 mm. long, 0,004–6 mm. thick; hymenial gelatine bluish then sordid-wine-red with iodine.—*Lecidea cumulata* Sommerf. Suppl. Fl. Lapp. p. 157 (1826). *L. conglomerata* Cromb. in Grevillea xxii. p. 59 (non Ach.).

One of the rarest British lichens. The squamules, either contiguous or scattered, are at times so minute and crowded in the centre that the thallus appears as if warted and cracked. The apothecia, densely conglomerate, very rarely solitary, are usually situated between the squamules. The single British specimen gathered is but sparingly fertile and spores are undeveloped.

Hab. On the ground in an alpine situation.—*B. M.* Near the summit of Ben Avon, Braemar, Aberdeenshire.

5. **B. lutea** Arnold in Flora xlii. p. 152 (1859).—Thallus effuse, very thin, leprose, greyish-white (K −, CaCl −), at times almost evanescent. Apothecia moderate in size, sessile, at first concave then plane or slightly convex, deep-yellow or yellowish-orange, the margin entire, thin, often flexuose, paler; paraphyses coherent; spores oblong or fusiform-oblong, 0,009–13 mm. long, 0,004–5 mm. thick; hymenial gelatine pale-bluish then violet with iodine.—Mudd Man. p. 177. *Lichen luteus* Dicks. Crypt. fasc. i. p. 11, t. 2, f. 6 (1785); With. Arr. ed. 3, iv. p. 25; Engl. Bot. t. 1263; Leight. Angioc. Lich. t. 14, f. 3. *Lecidea melizea* Ach. Lich. Univ. p. 194 (1810); S. F. Gray Nat. Arr. i. p. 474. *L. lutea* Borr. ex Hook. in Sm. Engl. Fl. v. p. 185 (1833); Tayl. in Mackay Fl. Hib. ii. p. 129; Cromb. Lich. Brit. p. 63; Leight. Lich. Fl. p. 317; ed. 3, p. 341.

The apothecia are occasionally large, with an inflexed more or less lobulate margin (f. *sublobulata* Cromb. in Grevillea xxii. p. 8). The spermogones are not unfrequent in our specimens; they are urceolate and might readily be taken for young apothecia.

Hab. On the bark of trees and on mossy trunks in maritime and upland districts.—*Distr.* Here and there in England, Wales, and Ireland, rare in the S.W. Highlands of Scotland and in the Channel Islands.—*B. M.* Rozel, Jersey; Danny and Hurstpierpoint, Sussex; New Forest, Hants; Holne Chase and Ullacombe near Bovey Tracey, Devon; Launceston, Tregawn, near Withiel and Penzance, Cornwall; Barmouth, Merioneth; Llandyssil, Cardiganshire; Inverary and Barcaldine, Argyll; near Belfast, Antrim; Ardrum and Enniskean, Cork; Askew Wood, Dunkerron, Glengariff and Killarney, Kerry; Lough Inagh, Connemara, Galway.

6. **B. diluta** Th. Fr. Lich. Arct. p. 185 (1860).—Thallus effuse, very thin, leprose, greenish- or greyish-white (K −, CaCl −), often evanescent. Apothecia superficial, minute, concave, margined, pale-reddish-yellow or whitish-flesh-coloured, the margin paler, smooth, thickish; hypothecium colourless; spores fusiform, 0,009–10 mm. long, 0,003–4 mm. thick; hymenial gelatine pale-bluish with iodine.—*B. pineti* Massal. Ric. Lich. p. 135 (1852); Mudd Man. p. 176. *Peziza diluta* Pers. Syn. p. 668 (1801). *Lichen pineti* Schrad. ex Ach. Meth. p. 68 (1803). *L. effusus* Sm. Engl. Bot. t. 1863, two lower figures (1808) (non Ach.). *Lecidea pineti* Ach. Lich. Univ. p. 195 (1810); Hook. in Sm. Engl. Fl. v. p. 183; Cromb. Lich.

Brit. p. 63; Leight. Lich. Fl. p. 317. *L. diluta* Leight. Lich. Fl. ed. 3, p. 343 (1879).

Exsicc. Leight. n. 80; Mudd n. 145; Larb. Lich. Hb. n. 187.

Has, like the preceding, been frequently regarded as a species of *Lecidea*, section *Biatora*. It is a rather inconspicuous plant from the thallus being little visible and from the minute fructification. The apothecia are numerous and usually somewhat scattered, with the margin slightly prominent. In some situations they are paler, nearly whitish, and here and there congested (f. *leucostigma* Leight. Lich. Fl. ed. 3, p. 344).

Hab. On the trunks of old firs in maritime and upland districts.—*Distr.* Somewhat local in Great Britain and Ireland; rare in the Channel Islands.—*B. M.* Rozel, Jersey; Ulting, Hadleigh Woods, Stanstead Mount Fitchet and Hockley Woods, Essex; Midhurst and Woolstonbury, Sussex; Brockenhurst and near Stoney Cross, New Forest, Hants; Sapperton, Gloucestershire; near Newmarket, Cambridgeshire; Twycross and Gopsall, Leicestershire; Welshpool, Montgomeryshire; Bettwys-y-Coed, Denbighshire; Shrewsbury, Shelton and Llanforda, Shropshire; Costessy, near Norwich, Norfolk; Cliffrigg, Cleveland, Yorkshire; Craggy Park, Staveley, Westmoreland; Barcaldine, Argyll; Glen Falloch and Ben Lawers, Perthshire; Durris, Kincardineshire; near Cork; Glenstale, Tipperary; near Limerick, Clare.

7. **B. jejuna** A. L. Sm.—Thallus dark-grey or bluish-grey-green, thin, effuse, continuous or slightly cracked. Apothecia minute, prominent, pale-waxy-reddish with a thickish pale margin; hypothecium colourless; epithecium yellowish; spores ellipsoid, 0,018–23 mm. long, 0,007–9 mm. thick; hymenial gelatine blue then violet with iodine.—*Lecanora jejuna* Nyl. in Flora lviii. p. 442 (1875). *Lecidea subdiluta* Leight. in Trans. Linn. Soc. ser. 2, i. p. 145, t. 22, figs. 13–16 (1876) & Lich. Fl. ed. 3, p. 340.

Exsicc. Larb. Lich. Hb. n. 846.

Hab. On siliceous rocks, rare.—*B. M.* Boulay Bay, Jersey (the only locality).

8. **B. Arnoldi** Krempelh. in Flora xxxviii. p. 72 (1855).—Thallus effuse, thin, subleprose, whitish (K −, CaCl −). Apothecia small, sessile or adnate, at first concave, margined, at length almost plane and subimmarginate, saffron-reddish, the margin paler; paraphyses slender, subdiscrete; epithecium and hypothecium deep-yellow; spores oblong, normally 1-septate (at times obsoletely 3-septate), 0,013–18 mm. long, 0,005–6 mm. thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea Arnoldi* Nyl. in Flora lxii. p. 223 (1879); Cromb. in Journ. Bot. lix. p. 361 (1876); Leight. Lich. Fl. ed. 3, p. 340.

From the appearance of the young apothecia might at first sight be taken for a *Gyalecta*. The thallus is often scarcely distinct, and is

then more or less confused with the substratum. In the British specimens the apothecia are minute and rather scattered.

Hab. On shaded calcareous rocks in mountainous tracts.—*Distr.* Only in N.W. Ireland and the S.W. Highlands, Scotland.—*B. M.* Achosragan Hill, Appin, Argyll; Twelve Pins, Connemara, Galway.

Var. **luteella** A. L. Sm.—Thallus thin, often in white patches. Apothecia colourless within, the asci usually thick and solid at the apices; spores oblong or oblong-fusiform, 0,016–23 mm. long, 0,006–7 mm. thick.—*Lecidea luteella* Nyl. in Flora xlviii. p. 6 (1865); Leight. in Ann. Mag. Nat. Hist. ser. 3, xvii. p. 62; Cromb. Lich. Brit. p. 73; Leight. Lich. Fl. p. 322; ed. 3, p. 339. Specimen not seen.

Differs from the type in the colourless hypothecium and epithecium and in the slightly larger spores.

Hab. On calcareous rocks in upland districts.—*Distr.* S. England (Eastbourne, Sussex) and N.E. Ireland (Sheepwalk, Armagh).

Subsp. **delutula** A. L. Sm.—Thallus very thin, at length rimose, greyish-green. Apothecia minute, usually gyalectoid, pale-yellowish-flesh-coloured; spores 0,012–16 mm. long, 0,004–5 mm. thick.—*Lecidea delutula* Nyl. in Flora lxii. p. 223 (1879); Cromb. in Grevillea viii. p. 30.

Characterized chiefly by the differently coloured thallus, and the paler, smaller apothecia. In the two specimens seen, which are well fertile, the thallus is scattered and only here and there visible.

Hab. On moist siliceous ferruginous rocks in a mountainous district.—*B. M.* Lough Feagh, Connemara, Galway (the only locality).

9. **B. bæomma** A. L. Sm.—Thallus indeterminate, thin, opaque, unequal, faintly cracked, glaucous or yellowish-white (K + yellow, CaCl −). Apothecia moderate, plane, subangulose-difform, pale-reddish, livid or livid-brown, with a white, thickish, epithalline margin; paraphyses somewhat slender; epithecium yellowish-granulose; spores oblong, 0,010–18 mm. long, 0004–6 mm. thick; hymenial gelatine bluish then tawny-wine-red with iodine. —*Lecanora bæomma* Nyl. in Flora lix. p. 233 (1876). *Lecidea bæomma* Nyl. in Flora lx. p. 459 (1877); Leight. Lich. Fl. ed. 3, p. 221. *L. rupicola* Nyl. *l. c.* pp. 228, 562; Cromb. in Grevillea vi. p. 19; Leight. Lich. Fl. ed. 3, p. 337.

Exsicc. Larb. Lich. Hb. n. 26.

Hab. On mica-schist rocks near the sea.—*B. M.* Letterfrack, Connemara, Galway (the only locality).

Var. **glaucocarnea** A. L. Sm.—Thallus determinate, rugulose or subleprose, cracked-areolate, glaucous-green. Apothecia pale-flesh-coloured or livid, sometimes slightly pruinose, the margin somewhat paler, at length evanescent.—*Lecidea glaucocarnea* Nyl. in Flora lx. p. 459 (1877). *L. cæsiolepra* Nyl. in Flora lxiv. p. 532 (1881); Cromb. in Journ. Bot. xx. p. 275 (1882).

Lecanora glaucocarnea Nyl. in Flora lx. p. 562 (1877); Leight. Lich. Fl. ed. 3, p. 221.

Exsicc. Larb. Lich. Hb. nos. 135, 336.

The apothecia in both type and variety are extremely minute and look as if seated on small pale cushions of the thallus, though in the variety the thalline growth tends to disappear.

Hab. On rocks.—*Distr.* Rare in the Channel Islands and W. Ireland.—*B. M.* Eperquerie, Sark; Glendalough, Connemara, Galway.

10. **B. littorella** A. L. Sm.—Thallus effuse, very thin, rimulose, glaucous-green. Apothecia small, plane, submarginate, pale-yellow; paraphyses slender; epithecium and hypothecium colourless; spores oblong, 0,008–12 mm. long, 0,0035–45 mm. thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea littorella* Nyl. in Flora lx. p. 229 (1877); Cromb. in Grevillea vi. p. 19; Leight. Lich. Fl. ed. 3, p. 339.

Differs from the preceding in the brighter coloured apothecia and in the constantly smaller spores.

Hab. On schistose rocks.—*B. M.* Lough Inagh, Connemara, Galway (the only locality).

11. **B. pilularis** Koerb. Parerg. Lich. p. 136 (1860).—Thallus effuse, thin, finely granular, greyish-white or greenish (K−, CaCl−). Apothecia adnate, convex or almost globose, immarginate, yellowish-flesh-coloured or brick-reddish; hypothecium colourless; paraphyses coherent, apices colourless; spores ellipsoid, 1-septate or sometimes simple, 0,011–17 mm. long, 0,005–6 mm. thick; hymenial gelatine bluish then violet or wine-reddish with iodine.—*Lecidea vernalis* f. *subduplex* Nyl. Lich. Scand. p. 201 (1861); Cromb. Lich. Brit. p. 68; Leight. Lich. Fl. p. 262; ed. 3, p. 259. *L. pilularis* Leight. Lich. Fl. ed. 3, p. 341 (1879). *L. subduplex* Nyl. Lich. Fret. Behr. p. 50 (1888).

Exsicc. Larb. Lich. Hb. nos. 231, 270.

Characterized by the bright prominent sometimes almost spherical apothecia which have caused it to be confused with *Bilimbia sphæroides*, Koerb. The apothecia are numerous and vary in size, at times they are crowded and rather small.

Hab. On mossy trunks of trees, rarely stems of shrubs in upland wooded situations.—*Distr.* Scarce in England; more frequent in the S. Highlands of Scotland, and in N.W. Ireland.—*B. M.* Hatfield-Peverel, Essex; St. Leonard's Forest, Sussex; Brandon, Suffolk; Ewenny, Bridgend, Glamorgan; Prescoed, near Usk, Monmouthshire; Cader Idris, Merioneth; Rievaulx and Bilsdale, Yorkshire; Woods, near Forfar; Barcaldine, Argyll; Glen Lochay, Killin, Ben Lawers and Aberfeldy, Perthshire; Leenane, Derryclare and Glendalough, Galway.

12. **B. subsphæroides** A. L. Sm.—Thallus determinate, thinnish, areolate-rimose, rugulose, whitish. Apothecia moderate

at first plane and thinly margined, at length convex and immarginate, pale-reddish; paraphyses not discrete; hypothecium pale; spores ellipsoid or oblong-ellipsoid, 0,014–17 mm. long, 0,006–7 mm. thick; hymenial gelatine bluish, the asci at length violet, with iodine.—*Lecidea subsphæroides* Nyl. in Flora lvi. p. 294 (1873); Cromb. in Grevillea ii. p. 89; Leight. Lich. Fl. ed. 3, p. 343.

Differs from the preceding in the more distinct thallus and in the plane apothecia.

Hab. On beech trees, rare.—*B. M.* Near Lyndhurst, New Forest, Hants (the only locality).

13. **B. graniformis** A. L. Sm.—Thallus effuse, granulate or verrucose-rugose, pale-yellow, whitish-glaucous or straw-coloured (Kf + yellowish, CaCl −), at times subevanescent. Apothecia small, adnate, pale-yellow, plane and obtusely margined, the margin often flexuose, at length slightly convex and immarginate; paraphyses coherent, colourless; epithecium subgranulose, yellow; hypothecium colourless; spores oblong or fusiform-oblong, thinly 1-septate, 0,008–11 mm. long, 0,0025–35 mm. thick; hymenial gelatine bluish then sordid-violet with iodine.—*B. Ehrhartiana* Mudd Man. p. 176 (1861). *Lichen graniformis* Hagen Tent. Hist. Lich. p. xlvii. t. 1, f. 2 (1782); Dicks. Crypt. fasc. i. p. 10; With. Arr. ed. 3, iv. p. 7; Engl. Bot. t. 1464 (spermogoniiferous state). *L. Ehrhartianus* Ach. Prodr. p. 39, t. 2, f. 1 (1798); Dicks. Crypt. fasc. iv. p. 22 (non Engl. Bot. t. 1136 which is *Lecanora conizæa* Ach.). *Lecidea Ehrhartiana* Ach. Meth. p. 73 (1803); S. F. Gray Nat. Arr. i. p. 474; Hook. in Sm. Engl. Fl. v. p. 185; Turn. & Borr. Lich. Brit. p. 142; Leight. Angioc. Lich. p. 69 & Lich. Fl. p. 320; ed. 3, p. 342; Cromb. Lich. Brit. p. 65. *Cliostomum corrugatum* Fr. Lich. Eur. p. 455 (spermogones only); Leight. Angioc. Lich. p. 69.

A singular plant which might readily be taken for a biatorine state of a species allied to *Lecanora varia*, of which Schærer (Enum. p. 82) considered it a variety. A very marked character is afforded by the numerous large spermogones, which were formerly regarded as foreign parasitical bodies or, in sterile specimens, as abortive apothecia. They are superficial, black, usually crowded, warted and corrugate (K + rose-violet), beneath colourless, with short, simple sterigmata and oblong spermatia, 0,002–3 mm. long, 0,001 mm. thick.

Hab. On old palings, rarely on trunks of trees, in maritime and upland situations.—*Distr.* Local, though plentiful where it occurs, in E., S., and W. England, and in S. Wales.—*B. M.* Near Acle and Yarmouth, Norfolk; Livermere, Suffolk; near Colchester, Essex; Penshurst, Kent; Henfield and Hurstpierpoint, Sussex; Pembridge, Herefordshire; Harboro' Magna, Warwickshire; Llandrindod, Radnorshire.

14. **B. cyrtella** Th. Fr. Lich. Arct. p. 186 (1860) (non Koerb. *fide* Th. Fr. Lich. Scand. p. 294 (1871).—Thallus effuse, very

thin, unequal, pale or whitish (K−, CaCl−), often evanescent. Apothecia small, at first plane, with thin white epithalline margin, then convex and immarginate, pale-brown, sordid- or pale-reddish, colourless within; paraphyses concrete, pale at the apices; hypothecium colourless; spores 8–16 in the ascus, oblong or oblong-fusiform, 1–2-septate, 0,009–16 mm. long, 0,004–5 mm. thick; hymenial gelatine bluish then wine-red or violet with iodine.—*Lecidea cyrtella* Ach. Meth. p. 67 (1803); S. F. Gray Nat. Arr. i. p. 471; Cromb. Lich. Brit. p. 72; Leight. Lich. Fl. p. 318; ed. 3, p. 341. *L. anomala* Ach. Syn. p. 38 (1814) pro parte; Hook. in Sm. Engl. Fl. v. p. 182 pro parte. *Lichen cyrtellus* Sm. Engl. Bot. t. 2155 (1810).

Exsicc. Larb. Lich. Hb. n. 173.

Referred sometimes to *Lecania* (*Lecanoraceæ*) on account of the thin epithalline margin which disappears soon, the species becoming wholly biatorine. The spores are usually of the 1-septate type of *Biatorina*, though in the same apothecia there are to be found 2-septate spores like those of *Bilimbia*.

Hab. On the bark of trees.—*Distr.* Not unfrequent throughout the British Isles.—*B. M.* Launceston, Cornwall; Shanklin, I. of Wight; Cockington, Devon; Henfield, Sussex; Hadleigh Woods, Southend, Essex; Farmington and near Cirencester, Gloucestershire; Thame Park, Oxfordshire; Malvern, Worcestershire; Ayton, Cleveland, Yorkshire; Glen Falloch, Perthshire; Riverstone, near Cork; Mount Shannon and Tervoe, Limerick; Dromoland, Clare.

15. **B. Griffithii** Massal. Ric. Lich. p. 134 (1852) pro parte; Mudd Man. p. 176.—Thallus effuse, thin, unequal or subgranular and wrinkled, whitish or greyish-white (K + yellow, CaCl−), occasionally nearly obsolete. Apothecia small or submoderate, adnate, plane, at length slightly convex, margined, brownish-flesh-coloured, dull-brown or blackish, the margin thin, pale; paraphyses more or less discrete, dark or yellowish at the apices; hypothecium colourless; spores fusiform or oblong, thinly 1-septate, 0,010–20 mm. long, 0,035–45 mm. thick; hymenial gelatine deep-blue then more or less sordid-wine-coloured with iodine.—*Lichen Griffithii* Sm. Engl. Bot. t. 1735 (1807). *Lecidea Griffithii* Hook. in Sm. Engl. Fl. v. p. 177 (1833); Tayl. in Mackay Fl. Hib. ii. p. 120; Cromb. in Grevillea xxii. p. 11 (incl. f. *limitata* Cromb.). *L. tricolor* Nyl. Lich. Scand. p. 207 (1861) (non With. *vide* Grevillea xii. p. 60); Cromb. Lich. Brit. p. 72; Leight. Lich. Fl. p. 321; ed. 3, p. 337. *Biatora mixta* Fr. in Vet. Acad. Handl. 1822, p. 267.

Exsicc. Bohl. n. 119; Mudd n. 155; Leight. n. 60 (as *Biatora mixta*); Larb. Lich. Hb. nos. 268, 345.

The original specimens were collected by Griffith and preserved in Withering's herbarium labelled *Lichen corneus*. Withering's description and figure of *L. corneus* do not agree with these specimens (see p. 9), as was pointed out by Smith (Engl. Bot. t. 1735), who

determined and named the plant *L. Griffithii* in honour of the collector.

Hab. On smoothish bark of trees, rarely on naked trunks, in upland, rarely maritime wooded tracts.—*Distr.* Not uncommon in England, scarce in the S.W. Highlands of Scotland, S. Ireland, and the Channel Islands.—*B. M.* St. Peter's Valley, Jersey; Runton, Norfolk; Gosfield Hall, Quendon Wood and Epping Forest, Essex; Ightham, Kent; St. Leonard's Forest, Sussex; New Forest, Hants; Ullacombe, Bovey Tracey, Devon; Oakley Park, Cirencester, and Sapperton, Gloucestershire; Twycross, Gopsall Park, Leicestershire; Malvern, Worcestershire; Limekiln Wood, Wrekin and Haughmond Hill, Shropshire; near Harboro' Magna, Warwickshire; Builth, Brecknockshire; Garn, Denbighshire; Ludlow and Haughmond Hill, Shropshire; Airyholm Wood and near Ayton, Cleveland, Yorkshire; Teesdale, Durham; by Loch Lomond, Dumbartonshire; Glen Falloch, Perthshire; Glenstale, Tipperary; Deer Park, Castle Bernard, Cork.

16. **B. Bouteillei** Arnold ex Syd. Flecht. Deutschl. p. 167 (1887).—Thallus effuse, thin, filmy, minutely granulose, pale-greenish-white (K−, CaCl−). Apothecia minute, adnate-sessile, plane, yellowish-flesh-coloured, the margin thin, entire or crenate-flexuose, paler; hypothecium colourless; paraphyses slender, irregular; spores ellipsoid, minute, 0,008–10 mm. long, 0,003–4 mm. thick; hymenial gelatine bluish then sordid-yellow, the asci persistently bluish at the apices, with iodine.—*Parmelia Bouteillei* Desmaz. in Ann. Sci. Nat. ser. 3, vii. p. 191 (1847). *Lecidea Bouteillei* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. p. 152 (1866); Cromb. in Journ. Bot. ix. p. 178 (1871); Leight. Lich. Fl. p. 323; ed. 3, p. 343.

Hab. On leaves of box and fir, and on elm bark. *Distr.* Rather rare in the Channel Islands and S. England on leaves of box.—*B. M.* Danny and Woolstonbury, Sussex.

17. **B. erysiboides** Th. Fr. in Vet. Akad. Förh. 1864, p. 271. —Thallus subeffuse, very thin, leprose, green or greenish, subobsolete (K−, CaCl−). Apothecia small, somewhat convex, immarginate, opaque, brick-coloured, reddish or yellowish, concolorous within; paraphyses coherent, colourless; hypothecium colourless; spores shortly ovoid, 0,007–10 mm. long, 0,003–5 mm. thick; hymenial gelatine bluish then sordid-wine-red with iodine. —*Lecidea erysiboides* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. i. p. 232 (1858–9); Cromb. in Grevillea xxii. p. 11 & Lich. Brit. p. 72 (excl. f. *sordidescens*); Leight. Lich. Fl. p. 323; ed. 3, p. 343 (excl. same form).

From its external aspect might readily be taken for a state of *Lecidea vernalis*, but is definitely separated by the ovoid spores, which are somewhat similar to those of many *Arthoniæ*. The thallus, usually scarcely visible, is often entirely obsolete. In moist situations the apothecia are at times pale, convex, and several congregate (f. *pallida* Nyl. ex Cromb. Lich. Brit. *l. c.*).

Hab. On decaying trunks and stumps of trees in wooded maritime and upland districts.—*Distr.* Very local in S. England and the S. Grampians, Scotland.—*B. M.* Shanklin, I. of Wight; Lymington, Hants; near Buckfastleigh, Devon; Cirencester, Gloucestershire; Loch Katrine, Perthshire (f. *pallida*).

18. **B. prasina** Syd. Flecht. Deutschl. p. 166 (1887).—Thallus effuse, thinnish, contiguous or scattered, subgranulose-leprose, sordid-greenish (K−, CaCl−). Apothecia minute, innate-sessile, convex, immarginate, livid-brown or blackish, concolorous within; paraphyses coherent; epithecium and hypothecium colourless; spores oblong-ellipsoid, simple or 1-septate, 0,011–12 mm. long, 0,004 mm. thick; hymenial gelatine bluish then sordid-wine-red with iodine.—*Micarea prasina* Fr. Syst. Orb. Veg. p. 257 (1825). *Lecidea prasina* Schær. Enum. p. 137 (1850); Mudd Man. p. 196; Leight. Lich. Fl. p. 263; ed. 3, p. 261. *L. prasiniza* Nyl. in Flora lvii. p. 312 (1874) & lxiv. p. 7 (1881); Cromb. in Journ. Bot. xiii. p. 141 (1875); Leight. Lich. Fl. ed. 3, p. 338.

Differs from *B. erysiboides* chiefly in the rather more developed thallus, the colour of the smaller, more convex apothecia and the often simple spores. The few British specimens gathered are well fertile; but the sterile pulverulent thallus spreads extensively over the substratum.

Hab. On old trunks of trees in a maritime locality.—*Distr.* Rare in England and S.W. Highlands of Scotland.—*B. M.* Lyndhurst, Hants; Barcaldine, Argyll.

Var. **byssacea** A. L. Sm.—Thallus minutely granular, dirty-greenish. Apothecia dark; paraphyses dark at the tips.—*Biatora byssacea* Zwackh. in Flora xlv. p. 510 (1862). *Lecidea erysiboides* f. *sordidescens* Nyl. ex Norrlin in Not. Sällsk. Faun. & Fl. Fenn. n. ser. viii. p. 208 (1871); Cromb. Lich. Brit. p. 72; Leight. Lich. Fl. p. 323; ed. 3, p. 343. *Biatorina prasiniza* f. *byssacea* Arnold Lich. Fl. Münch. p. 24 (1897).

Differs from the type in the darker colour of the apothecia and of the paraphyses.

Hab. On old decorticated trees.—*B. M.* Lyndhurst, New Forest, Hants.

19. **B. globulosa** Koerb. Syst. Lich. Germ. p. 191 (1855).—Thallus effuse, very thin, granulose-pulverulent, whitish (K−, CaCl−), often evanescent. Apothecia small, adnate, convex, immarginate, blackish or leaden-black, greyish within; paraphyses concrete; epithecium blackish; hypothecium pale or slightly sordid above; spores oblong or fusiform-oblong, simple or thinly 1-septate, 0,009–0,014 mm. long, 0,002–4 mm. thick; hymenial gelatine bluish then dark-wine-red with iodine.—*Lecidea globulosa* Floerke Deutsche Lich. lief. 10, p. 1 (1821); Carroll in Journ. Bot. v. p. 256 (1867); Cromb. Lich. Brit.

p. 69; Leight. Lich. Fl. p. 319; ed. 3, p. 334. *L. anomala* Nyl. Lich. Scand. p. 202 (non Ach.); Leight. Lich. Fl. p. 318; ed. 3, p. 337. *Biatora anomala* Fr. in Vet. Acad. Handl. 1822, p. 226. *Bilimbia anomala* Mudd Man. p. 187 (1861) pro parte.

Exsicc. Mudd n. 155.

Hab. On the bark of trees.—*Distr.* Not uncommon throughout the British Isles.—*B. M.* Ulting, Hadleigh and Hockley, Essex; Chelworth, Wilts; Ayton, Cleveland, Yorkshire; Glencar, Kerry.

20. **B. fallax** A. L. Sm.—Thallus effuse, thin, subleprose, blackish-green. Apothecia yellowish-flesh-coloured, somewhat convex, becoming immarginate, entirely colourless within; paraphyses slender, distinct; spores oblong or oblong-fusiform, 0,009–13 mm. long, 0,003 mm. thick; hymenial gelatine blue then violet with iodine.—*Biatora fallax* Hepp Flecht. Eur. n. 505 (1860) (excl. syn). *Lecidea fallax* Leight. Lich. Fl. p. 320 (1871); ed. 3, p. 342. *L. chlorotiza* Nyl. in Flora xlix. p. 85 (1866) (*fide* Leight. *ll. c.*); Cromb. Lich. Brit. p. 70.

There are no specimens in the British Museum. Hepp plainly indicates the 2-celled spores which exclude it from *Lecidea*.

Hab. On elm bark.—*Distr.* Recorded only from S. England (I. of Wight and Somerset).

21. **B. spodiza** A. L. Sm.—Thallus effuse, thin, subopaque, minutely granulate, dark-greyish or inspersed with minute greyish-green granules (K(CaCl) + deep-red). Apothecia small, somewhat convex, immarginate, livid-greyish or pale-livid, colourless within; epithecium sordid; paraphyses not well discrete; hypothecium colourless; spores oblong, at times somewhat curved, simple, occasionally obsoletely or spuriously 1-septate, 0,011–17 mm. long, 0,0025–35 mm. thick; hymenial gelatine bluish with iodine.—*Lecidea spodiza* Nyl. in Flora lvii. p. 9 (1874); Cromb. in Grevillea ii. p. 140; Leight. Lich. Fl. ed. 3, p. 339.

Closely allied to the following. In the original locality, the thallus spread extensively over the substratum, but was only here and there fertile; the apothecia in the specimens are somewhat scattered.

Hab. On an old fir paling in a wooded upland district.—*B. M.* Killin, Perthshire (the only locality).

22. **B. synothea** Koerb. Parerg. Lich. p. 144 (1860) (excl. var. *chalybæa*).—Thallus effuse, thin, minutely granulose, greyish-green or whitish (K−, CaCl−), at times nearly evanescent. Apothecia small, adnate or appressed, convex, subimmarginate, dark-brown, black or blackish; hypothecium thin, colourless, paraphyses dark at the apices; epithecium K+violet; spores oblong, ellipsoid-oblong or fusiform, straight or slightly curved, occasionally simple, 0,007–13 mm. long, 0,0025–40 mm. thick; hymenial gelatine bluish then wine-red with iodine; spermogones

numerous, spermatia oblong or oblong-ellipsoid, 0,004–5 mm. long, 0,002 mm. thick.—Mudd Man. p. 179. *Lecidea synothea* Ach. Syn. p. 26 (1814) pro parte; Borr. in Engl. Bot. Suppl. t. 2711; Hook. in Sm. Engl. Fl. p. 179. *L. denigrata* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. p. 149 (1866); Cromb. in Grevillea xxii. p. 10 & Lich. Brit. p. 70; Leight. Lich. Fl. p. 320; ed. 3, p. 364. *L. parissima* Nyl. ex Cromb. in Journ. Linn. Soc. xi. p. 484 (1871) & Journ. Bot. ix. 178 (1871); Leight. Lich. Fl. ed. 3, p. 256. *L. hemipoliella* Nyl. in Flora lviii. p. 11 (1875); Leight. Lich. Fl. ed. 3, p. 339 (e descript.). *Biatora denigrata* Fr. in Vet. Acad. Handl. 1822, p. 265 & Lich. Eur. p. 270.

Exsicc. Johns. n. 373.

Well characterized by the structure of the apothecia and the appearance of the spermogones. The thallus, which spreads extensively, is at times blackish, and occasionally but little visible, but in that case the numerous and often conglomerate apothecia make the plant sufficiently conspicuous. The spermogones are usually abundant and are readily observed from the extrusion of the white spermatia in the form of globules.

Hab. On old palings, and occasionally on decorticated stumps of trees in upland wooded districts.—*Distr.* Not unfrequent in England, apparently rare in Scotland; not seen from Ireland or the Channel Islands.—*B. M.* Near Highbeach, Epping Forest, Essex; Esher, Surrey; near Tunbridge Wells, Kent; Albourne and Henfield, Sussex; New Forest, Hants; near Bovey Tracy, Devon; near Hendon and Mill Hill, Middlesex; Oaksey, Wilts; near Elstree, Herts; Chelmsford, Essex; Twycross and Gopsall, Leicestershire; Battenhall, near Worcester; near Barmouth, Merioneth; Oswestry and near Shrewsbury, Shropshire; near Ayton, Cleveland, Yorkshire; Egremont, Cumberland; Finlarig, Killin, Perthshire.

Var. **semialbula** A. L. Sm.—Thallus whitish or livid-whitish, thin, slightly rimulose-areolate; spores 2–4-guttulate, septa discernible on treatment with potash.—*Lecidea hemipoliella* var. *semialbula* Nyl. ex Stirton in Trans. Glasgow Soc. Nat. 1875, p. 89 (*fide* Leight.); Leight. Lich. Fl. ed. 3, p. 339. Specimen not seen.

Hab. On decorticated wood. Collected by Dr. Stirton near Altnaharra, Sutherland.

Subsp. **subnigrata** A. L. Sm.—Thallus effuse, granulose-areolate and furfuraceous, dark-greyish (K−, CaCl−). Apothecia small, convex, immarginate, usually conglomerate, brownish- or reddish-black, colourless within; epithecium sordid-yellowish, paraphyses not discrete; hypothecium colourless; spores ellipsoid, 0,009–11 mm. long, 0,004–5 mm. thick; hymenial gelatine bluish with iodine.—*Lecidea subnigrata* Nyl. in Flora xlix. p. 370 (1866); Leight. Ann. Mag. Nat. Hist. ser 3, xix. p. 403 (1867) & Lich. Fl. p. 316; ed. 3, p. 331. *Lecidea denigrata* subsp. *subnigrata* Cromb. Lich. Brit. p. 70.

Scarcely to be distinguished from the species, the minor differences being due to the nature of the substratum. In the specimens seen the apothecia are numerous.

Hab. On schistose rocks in hilly and mountainous districts.—*Distr.* Very local and scarce in S.W. England, N. Wales, and the central Grampians, Scotland.—*B. M.* Bathampton Downs, Somerset; Cader Idris, Merioneth; Craig Tulloch, Blair Athole, Perthshire.

23. **B. premnea** A. L. Sm.—Thallus greyish-green or whitish, cartilaginous, thin, unequal, continuous or rimose (K−, CaCl−). Apothecia rather large, black, scattered, sessile, plane, the disc minutely papillate, margin thickish, shining, becoming convex and immarginate; hypothecium bluish-black; paraphyses slender, conglutinate, dark-bluish-green or dark-brown towards the tips; spores ellipsoid or oblong, obtuse, rather large, 0,020–30 mm. long, 0,008–18 mm. thick, sometimes slightly constricted at the septum; hymenial gelatine blue then wine-red with iodine.—*B. grossa* Mudd Man. p. 181 (1861). *Lecidea premnea* Fr. in Vet. Acad. Handl. 1822, p. 260 (pro max. parte, *fide* Th. Fr. Lich. Scand. p. 581) (non Ach.). *L. grossa* Nyl. in Act. Soc. Linn. Bord. ser. 3, i. p. 385 (1857); Cromb. Lich. Brit. p. 89; Leight. Lich. Fl., p. 310; ed. 3, p. 328. *L. leucoplaca* Chev. Fl. Env. Paris, p. 572 (1826).

Exsicc. Mudd n. 147; Leight. n. 125 (as *Lecidea leucoplaca*); Johns. n. 360.

Liable to be confused with *Lecanactis premnea*, to which it is externally somewhat similar. Often cited as *L. grossa* Pers. a manuscript name in Hb. Mougeot.

Hab. On trunks of trees in wooded regions.—*Distr.* Frequent in most parts of the British Isles.—*B. M.* Withiel, Cornwall; Newton Bushell, Devon; Bembridge, I. of Wight; Lyndhurst, Hants; between Henfield and Brighton, and Cowdown, Poynings, Sussex; Shiere, Surrey; Kent; Chedworth Woods, near Cirencester, Gloucestershire; Gopsall Wood, Leicestershire; Nannau, Dolgelly, Merioneth; Windermere, Westmoreland; Airyholme Wood, Cleveland, Yorkshire; Lanark; near Edinburgh; The Trossachs, Kenmore, Aberfeldy, Glen Falloch, Glen Lochay and Finlarig, Killin, Perthshire; Appin and Barcaldine, Argyll; Invermoriston and Fort William, Invernessshire; Morrone, Braemar, Aberdeenshire; Derryquin, Glencar, Muckruss and Dinish, Kerry; Dromoland, Clare; Loughcooter, Galway.

24. **B. pulverea** Mudd Man. p. 180 (1861).—Thallus effuse, thickish, minutely granular-pulverulent or leprose, soft, greyish-green, glaucous, or yellowish-green, becoming white (K + yellow, CaCl−). Apothecia somewhat large, scattered, adnate-sessile, plane, black with a paler rather prominent margin, becoming convex and immarginate, pale within, the lower stratum white; paraphyses coherent, blackish at the apices; spores oblong or ellipsoid, 1-septate, 0,015–19 mm. long, 0,007–9 mm. thick; hymenial gelatine deep-blue then violet-coloured with iodine.—

Lecidea pulverea Borr. in Engl. Bot. Suppl. t. 2726 (1831); Hook. in Sm. Engl. Fl. p. 181; Tayl. in Mackay Fl. Hib. ii. p. 126; Cromb. Lich. Brit. p. 89; Leight. Lich. Fl. p. 322; ed. 3, p. 334.

Exsicc. Bohl. n. 90; Cromb. n. 187; Larb. Lich. Hb. n. 150.

Resembles *B. Lightfootii* var. *commutata*, but is easily distinguished by the larger spores. The apothecia are, according to Nylander (Flora li. p. 347), at times pale-flesh-coloured, which is not the case in the British specimens.

Hab. On trunks of old trees generally near the roots, rarely incrusting mosses on rocks in maritime and mountainous districts.—*Distr.* Somewhat local, though usually plentiful where it occurs throughout the British Isles.—*B. M.* Withiel, Cornwall; near Torquay and Lustleigh, Devon; New Forest, Hants; Ardingly and St. Leonard's Forest, Sussex; Capel Cym and Barmouth, Merioneth; Maltby Wood, Yorkshire; Windermere, Westmoreland; Keswick, Cumberland; Falls of Clyde, Lanark; Barcaldine, Argyll; Glen Falloch, Glen Lochay and Aberfeldy, Perthshire; Glengariff, Cork; Mangerton, Muckruss, Dromore and Turk Mt., Kerry; Addergoole, near Kylemore, Glendalough and Doughruagh Mt., Galway.

25. **B. Lightfootii** Mudd Man. p. 179 (1861).—Thallus determinate or subeffuse, thickish, granulose-verrucose, greenish-white or greenish-grey (K−, CaCl−). Apothecia moderate, subinnate-sessile, plane or rather convex, slightly shining, dark-brown or black, margined, the margin thin, smooth, entire or flexuose, paler; paraphyses concrete, brown at the apices; hypothecium pale-greyish; spores ellipsoid, faintly 1-septate, constricted in the middle.—*Lichen Lightfootii* Sm. Engl. Bot. t. 1451 (1805). *Lecidea Lightfootii* Ach. Lich. Univ. p. 177 (1810); S. F. Gray Nat. Arr. i. p. 469; Hook. in Sm. Engl. Fl. v. p. 180; Cromb. Lich. Brit. p. 65; Leight. Lich. Fl. p. 319; ed. 3, p. 333.

Exsicc. Larb. Lich. Hb. n. 106.

Somewhat similar in habit and appearance to *L. parasema*. The innate apothecia occasionally seem as if crowned by the thalline granules, which, in conjunction with their paler margin, suggests a *Lecanora*; there are, however, no traces of a true thalline margin. In some habitats (*e.g.* firs) the thallus is much thinner with the granules more scattered and the apothecia smaller. The spermogones are small and brown; the spermatia subglobose and very minute 0,002 mm. long, 0,0015 mm. thick.

Hab. On the smooth trunks of trees, chiefly birch, rarely fir, in upland wooded districts.—*Distr.* Not unfrequent in England, Wales, and S. Ireland.—*B. M.* Reigate Hill, Surrey; St. Leonard's Forest, Ardingly Rocks, near Parham, near Petworth, near Eastham, Cuckfield, Hayward's Heath and Wiggonbolt Common, Sussex; Lyndhurst, New Forest, Hants; Ullacombe, Dartmoor, Devon; Lewknor, Oxfordshire; near Raider Dû, Radnorshire; Dolymelynen and Nannau, Dolgelly, Merioneth; Baysdale, Cleveland, Yorkshire; Riverstown, Cork; Dunkerron, Kerry.

Var. β **commutata** Mudd *l. c.*—Thallus granulose-leprose or subpulverulent, greenish-grey. Apothecia as in the type.—*Leca-*

nora commutata Ach. Lich. Univ. p. 352 (1810). *Lecidea Lightfootii* var. *β commutata* Schær. Enum. p. 138 (1850); Cromb. Lich. Brit. p. 65; f. *commutata* Leight. Lich. Fl. p. 319; ed. 3, p. 333.

Might perhaps be regarded as merely an old condition, characterized by the thallus becoming dissolved and pulverulent throughout. Transition states to the type are not wanting, and in otherwise typical specimens the granules are here and there deliquescent. Schærer describes the apothecia as being also carneous or reddish-brown, colours not visible in his own specimen or in ours; they are blackish and sometimes slightly umbonate.

Hab. On the trunks of old trees, rarely on old palings, in maritime and upland tracts.—*Distr.* Rare in S. England, S. Ireland, and the Channel Islands.—*B. M.* Patrimonie, Jersey; near Parham, Sussex; Brockenhurst, New Forest, Hants; near Cirencester, Gloucestershire; Killaloe, Clare; Cahirlogue, near Glenmire, and Agharda, Cork.

26. **B. atropurpurea** Massal. Ric. Lich. p. 135 (1852).—Thallus effuse, thin, granulose-leprose, greenish-grey (K−, CaCl−). Apothecia small, appressed or adnate, plane, thinly margined, purplish- or brownish-black; paraphyses discrete, brownish at the apices; hypothecium pale; spores subellipsoid, 0,011–15 mm. long, 0,005–7 mm. thick; hymenial gelatine pale-bluish then deep-wine-red with iodine.—Mudd Man. p. 178. *Lecidea sphæroides* var. *β atropurpurea* Schær. Spicil. p. 165 (1833). *L. atropurpurea* Cromb. Lich. Brit. p. 64 (1870); Leight. Lich. Fl. p. 324; ed. 3, p. 338. *L. atropurpurascens* Nyl. in Flora lvi. p. 294 (1873); Leight. Lich. Fl, ed. 3, p. 338.

Exsicc. Larb. Lich. Hb. n. 151; Johns. n. 338.

Hab. On trunks of old trees in wooded maritime and upland districts.—*Distr.* Only a few localities in S. England, Wales, and W. Ireland; not seen from Scotland.—*B. M.* Rozel, Jersey; St. Leonard's Forest and Chillington, Sussex; New Forest, Hants; Cockington, Devon; Selhurst, Surrey; Stanstead Park, Essex; Garth, Dolgelly, Merioneth; Gwydir Woods, Bettws-y-Coed, Denbighshire; Calder Abbey Grounds, Cumberland; Glenbower Wood, Cork; Dinish, Cromaglown and Glengariff, Kerry; Lough Inagh, Connemara, Galway.

27. **B. intermixta** A. L. Sm.—Thallus determinate, thin, subgranulose-rugulose, greyish or greyish-green (K + yellow, CaCl−). Apothecia moderate, plane or somewhat convex, brownish-black or black, the margin obtuse, thin, at length obliterated; dark within; paraphyses slender or not well discrete; epithecium slightly blackish; hypothecium reddish-brown (K + violet); spores ellipsoid or oblong, 0,015–18 mm. long, 0,006–7 mm. thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea intermixta* Nyl. in Ann. Sci. Nat. ser. 4, iii. p. 161 (1855); Cromb. Lich. Brit. p. 64; Leight. Lich. Fl. p. 314.

L. Laureri Leight. Lich. Fl. ed. 3, p. 314 (1879). *Catillaria Laureri* Hepp in Arn. exs. n. 353 (1867).

Exsicc. Johns. n. 337.

On the bark of trees, chiefly beech, rare.—*B. M.* Lyndhurst, New Forest, Hants.

28. **B. lenticularis** Koerb. Syst. Lich. Germ. p. 191 (1855). —Thallus thin, effuse or evanescent, brownish or greyish (K−, CaCl−). Apothecia small, adnate, reddish-brown or black, plane with a prominent margin becoming convex and immarginate; hypothecium brownish or colourless; paraphyses slender, distinct, brown or blackish-brown at the capitate tips; spores oblong, small, 0,006–11 mm. long, 0,002–4 mm. thick; hymenial gelatine blue then wine-red with iodine.—*Lecidea lenticularis* Ach. Syn. p. 28 (1814)?; Cromb. Lich. Brit. p. 91 pro parte (excl. syn. & subsp. *nigroclavata*); Leight. Lich. Fl. p. 315; ed. 3, p. 335 (excl. f. *nigroclavata*). *L. umbrinella* Nyl. in Flora lix. p. 309 (1876); Cromb. in Grevillea v. p. 27; Leight. Lich. Fl. ed. 3, p. 327. *Zeora lenticularis* Flot. in Uebers. Schles. Ges. Vaterl. Cult. p. 124 (1850).

Exsicc. Larb. Lich. Hb. nos. 70, 112, 314; Johns. n. 394.

Distinguished by the small size of the apothecium and its contents, and especially by the almost globose tips of the paraphyses, the upper part of which is coloured dark-brown, resembling those of *Lecidea nigroclavata* which has been classified by several authors as a variety of this species, but is included in *Lecidea* on account of the constantly simple spores. Several varieties in addition to those recorded have been distinguished—var. *acrustacea* Hepp (ex Arnold in Flora xli. p. 502 (1858); Leight. Lich. Fl. ed. 3, p. 336 as form) represents a condition with evanescent thallus; var. *vulgaris* Koerb. (Par. Lich. p. 144 (1860); Leight. *l. c.* p. 335 as form) as understood by Leighton differs from the type in including only those with a distinct thallus; f. *oxydata* Leight. (*l. c.* p. 336) has a ferruginous-ochraceous thallus, and is probably identical with var. *erubescens*.

Hab. On rocks in maritime and upland districts.—*Distr.* Not unfrequent throughout the British Isles.—*B. M.* La Moye, Jersey; Anstey's Cove, Torquay, Devon; Bathampton Downs, Somerset; Beachy Head, Sussex; Bisley and near Cirencester, Gloucestershire; Llanymynech Hill, Shropshire; Bangor and Snowdon, Carnarvonshire; St. Bees, Cumberland; Lismore, Argyll; Craig Guie, Braemar, Aberdeenshire; near Cork Harbour; Blackwater Bridge and Dinish, Kerry; Killree, Clare; Kylemore Lake and Lettermore, Connemara and Tully, Galway.

Form **nigricans** Arnold in Flora xliii. p. 74 (1860).—Thallus blackish, thin, furfuraceous, areolate, plane. Apothecia slightly larger than in the type, black.—*Lecidea lenticularis* f. *nigricans* Leight. Lich. Fl. ed. 3, p. 336.

The form *rimoso-areolata* (Leight. *l. c.*) agrees with this in the dark areolate thallus and blackish apothecia. In Larbalestier's specimen the thallus is very much broken up and located in the crevices of the rock, and is a slightly thicker state of f. *nigricans*.

Hab. On rocks.—*Distr.* W. England, Wales and W. Ireland, rare. —*B. M.* Bathampton Downs, Somerset; near Towyn, Merioneth; near Cirencester, Gloucestershire; Renvoyle, Connemara, Galway (f. *rimoso-areolata*).

Var. **erubescens** Koerb. *l. c.*—Thallus thin, effuse, forming white, yellowish or reddish patches. Apothecia innate then adnate, small, dark when dry, reddish-black or brownish when wet, with a blackish margin.—*Zeora lenticularis* var. *erubescens* Flot. *l. c.* *Lecidea lenticularis* f. *rhyparocarpa* Nyl. ex Leight. Lich. Fl. ed. 3, p. 336 (1879).

Hab. On rocks in maritime and upland districts.—*Distr.* Rare in S. and N. England, the Scottish Grampians and W. Ireland.—*B. M.* Launceston, Cornwall; Bilsdale, Yorkshire; Craig Tulloch, Blair Athole, Perthshire; Kenmare, Kerry, Kylemore, Connemara, Galway.

Var. **chloropoliza** A. L. Sm.—Thallus thin, greyish-green, unequal or wrinkled or almost evanescent. Apothecia often somewhat larger.—*Lecidea lenticularis* subsp. *chloropoliza* Nyl. in Bull. Soc. Bot. Fr. viii. p. 758 (1861); Cromb. Lich. Brit. p. 91; var. *chloropoliza* Leight. Lich. Fl. p. 316; ed. 3, p. 336.

Exsicc. Larb. Lich. Hb. n. 313.

Characterized by the usually more developed thallus and larger apothecia.

Hab. On granitic and schistose rocks, very rarely erratic on dead wood in maritime districts.—*Distr.* Only sparingly in the Channel Islands, N.E. Scotland and W. Ireland.—*B. M.* Sark; Boulay Bay and near St. Aubin's (lignicolous), Jersey; Portlethen and Cove, Kincardineshire; Killree, Clare.

29. **B. rhypodiza** A. L. Sm.—Thallus indeterminate, thin or very thin, subgranulate, brownish-black. Apothecia small, plane, thinly margined, blackish; paraphyses rather thick, brown at the thickened clavate apices; perithecium brown; hypothecium colourless; spores oblong, 0,014–16 mm. long, 0,005–6 mm. thick; hymenial gelatine bluish then wine-reddish with iodine.—*Lecidea rhypodiza* Nyl. in Flora lxiv. p. 5 (1881); Cromb. in Grevillea x. p. 23.

Resembles in outward appearance f. *nigricans* of the preceding species, but differs in the form of the paraphyses and larger spores. Spermogones have not been seen.

Hab. On a schistose rock in an alpine situation.—*B. M.* Summit of Craig Calliach, Perthshire (the only locality).

30. **B. chalybeia** Mudd Man. p. 180 (1861).—Thallus subeffuse, thin, continuous or minutely rimulose, dark-grey or leaden-black (K−, CaCl−, medulla I—); hypothallus very thin, black. Apothecia small, sessile, plane or slightly convex, margined, black, the margin thin, entire; hypothecium thickish, brownish-black; paraphyses thickish, black at the clavate apices; spores oblong, ellipsoid, thinly 1-septate, minute, 0,007–0,010 mm.

long, 0,0025–35 mm. thick; hymenial gelatine deep-blue with iodine—*B. melastigma* Mudd Man. *l. c.* *Lecidea chalybeia* Borr. in Engl. Bot. Suppl. t. 2687, fig. 2 (1831); Nyl. in Mém. Soc. Cherb. ii. p. 333 (1854); Hook. in Sm. Engl. Fl. v. p. 176; Cromb. Lich. Brit. p. 91; Leight. Lich. Fl. p. 312; ed. 3, p. 327. *Lecidea melastigma* Tayl. in Mackay Fl. Hib. ii. p. 115 (1836); Leight. Lich. Fl. ed. 3, p. 331.

Exsicc. Larb. Lich. Hb. nos. 148, 149; Johns. n. 393.

Apt to be confounded with states of *B. lenticularis* to which it is intimately related, but easily distinguished by the colour of the apothecia and more especially by the dark hypothecium and epithecium. The apothecia are usually scattered and numerous. The spermogones are minute, semi-immersed, black, with shortly ellipsoid spermatia, 0,002–8 mm. long, 0,001 mm. thick.

Hab. On siliceous rocks and stones in maritime and upland tracts.—*Distr.* Somewhat rare throughout the British Isles.—*B. M.* St. Ouen's Bay, Jersey; Patcham, Aldrington Beach, near Brighton and the South Downs, Sussex; Lamynack Carne, near Penzance, Cornwall; Fishguard Harbour, Pembrokeshire; Trefriw Falls, Carnarvonshire; Bilsdale, Yorkshire; St. Bees, Cumberland; Ben Lawers, Perthshire; Portlethen, Kincardineshire; Craig Guie, Braemar, Aberdeenshire; near Cork; Duncarron, Kerry; near Kylemore, Letterbeg and Glencorbot, Connemara, Galway.

Subsp. **chloroscotina** A. L. Sm.—Thallus more deeply cracked, greyish-green. Apothecia somewhat plane and wrinkled; hypothecium brownish-black, the hymenium bluish (K + violet); spores 1-septate, sometimes simple, 0,008–16 mm. long, 0,003–4 mm. thick, hymenial gelatine bluish then tawny-reddish with iodine. Spermogones and spermatia as in the species.—*Lecidea chloroscotina* Nyl. in Flora lx. p. 565 (1877) & lxv. p. 456 (1882); Cromb. in Grevillea vi. p. 113; Leight. Lich. Fl. ed. 3, p. 352 pro parte.

Exsicc. Larb. Lich. Hb. n. 180.

Distinguished from the species by the thicker more deeply cracked thallus and the somewhat large spores which are sometimes simple.

Hab. On moist siliceous stones in streams.—*Distr.* Very local, though common where it occurs in W. Ireland and (*fide* Nylander) in N.W. England (Kentmore, Westmoreland).—*B. M.* Between Lough Feagh and Lough Muck, Connemara, Galway.

31. **B. dolosa** A. L. Sm.—Thallus determinate, thin, minutely granular, olive or tawny-olive-brown. Apothecia minute, plane, dark-brown, with a thin paler margin, becoming somewhat convex and immarginate; hypothecium colourless; paraphyses slender, brown at the clavate apices; spores ellipsoid, 0,011–12 mm. long, 0,005–6 mm. thick; hymenial gelatine bluish then dark-violet with iodine.—*Lichen dolosus* Sm. Engl. Bot. t. 2581 (1814) (non Ach.). *Lecidea Gagei* Hook. in Sm. Engl. Fl. v. p. 177 (1833); Tayl. in Mackay Fl. Hib. ii. p. 120. *L. lenticularis* var. *Gagei* Cromb. in Journ. Bot. ix. p. 179 (1871).

An interesting plant hitherto rightly defined only by Nylander (Flora xvii. p. 308 (1874) as *Lecanora elæiza*). In the original specimen the thallus is in small, rotundate, detached patches, limited by a paler fibrillose hypothallus; but in a subsequent specimen from Sir Thomas Gage, the thallus is much better developed and more contiguous, with the hypothallus less visible. The apothecia are chiefly central and not numerous. The spermogones, sparingly visible, have the spermatia (*fide* Nyl. *l. c.*) minute, oblong, 0,0025 mm. long, 0,0010 mm. thick, on septate somewhat turgid sterigmata.

Hab. On a rock in an upland tract of a mountainous region.—*Distr.* Found only very sparingly in S.W. Ireland (recently also in Hungary).—*B. M.* Killarney, Kerry.

32. **B. columnatula** A. L. Sm.—Thallus indeterminate, sordid-yellow, composed as it were of small erect connate columns and divided into areolæ (K + yellow). Apothecia superficial, black, small, somewhat plane and obtusely margined, becoming immarginate, whitish or yellowish within; paraphyses not well discrete; epithecium and perithecium blackish; spores oblong, 0,012–16 mm. long, 0,004 mm. thick; hymenial gelatine bluish then tawny-wine-red with iodine.—*Lecidea columnatula* Nyl. in Flora lx. p. 228 (1877); Cromb. in Grevillea vi. p. 19; Leight. Lich. Fl. ed. 3, p. 332. Specimen not seen.

Well characterized by the columnar thallus. The spermogones have branched sterigmata and minute spermatia, 0,0035 mm. long, 0,0006 mm. thick.

Hab. On a schistose rock in a maritime district. Collected by Larbalestier at Kylemore, Connemara, Galway.

33. **B. biformigera** A. L. Sm.—Thallus dirty-greenish-white, tartareous, thick, tumid, warted-areolate, variously cracked (K + yellow, CaCl + yellow). Apothecia black or bluish-black, small and conglomerate, plane and slightly margined, or large, sessile with a thickish flexuose margin; hypothecium colourless, the hymenium pale-bluish upwards; paraphyses distinct, blackish at the tips; spores narrowly oblong, 1-septate, the cells biguttulate, 0,014–15 mm. long, 0,004–5 mm. thick; hymenial gelatine blue with iodine.—*Lecidea biformigera* Leight. in Ann. Mag. Nat. Hist. ser. 3, xix. p. 403 (1867) & Lich. Fl. p. 321; ed. 3, p. 332; Cromb. Lich. Brit. p. 90.

Exsicc. Larb. Lich. Hb. n. 105; Johns. n. 392.

Form *subbiformata* (Nyl. ex Leight. Lich. Fl. ed. 3, p. 333 (1879)) differs from the type in the plane areolæ of the thallus.

Hab. On maritime and alpine rocks.—*Distr.* Somewhat rare in the Channel Islands, central and N. England and W. Ireland, more frequently found in Wales, not yet recorded from Scotland.—*B. M.* Alderney; Longmynd, Shropshire; Tenby, Pembrokeshire; Llyn Aran, Dolgelly and Cader Idris, Merioneth; Llandbedrog and Snowdon, Carnarvonshire; Whitehaven, Cumberland; Doughruagh Mt. and Lough Feagh, Connemara, Galway.

34. **B. lutosa** Jatta Syll. Lich. Ital. p. 381 (1900).—Thallus dirty-ochraceous, tartareous, cracked-areolate, the areolæ plane, sometimes minutely lobate (K−, CaCl−). Apothecia black, innate and immarginate, then appressed, plane, with a thin prominent margin; hypothecium black; paraphyses distinct, thicker and blackish at the tips; spores oblong, rather small, 0,010–12 mm. long, 0,005–6 mm. thick.—*Lecidea lutosa* Mont. ex Schær. Enum. p. 116 (1850); Mudd Man. p. 202; Cromb. Lich. Brit. p. 78; Leight. Lich. Fl. p. 311; ed. 3, p. 326. Specimen not seen.

Hab. On rocks in upland regions.—*Distr.* Somewhat rare. Recorded from Devon, Shropshire and Yorkshire.

35. **B. contristans** A. L. Sm.—Thallus effuse, thin, granulose, brown or dark-brown (K−, CaCl−). Apothecia small, convex, immarginate, black, dark within; paraphyses coherent; epithecium blackish; hypothecium sordid; spores ellipsoid or oblong, 0,010–14 mm. long, 0,003–4 mm. thick; hymenial gelatine bluish then sordid-yellow with iodine.—*Lecidea contristans* Nyl. in Flora xlviii. p. 354 (1865); Leight. in Ann. Mag. Nat. Hist. ser. 3, xvii. p. 62 (1866) & Lich. Fl. p. 312; ed. 3, p. 329; Cromb. Lich. Brit. p. 72. *L. holomeloides* Nyl. in Flora xlix. p. 369 (1866); Leight. in Ann. Mag. Nat. Hist. ser. 3, xix. p. 330 (1867) & Lich. Fl. p. 323; ed. 3, p. 333; Cromb. Lich. Brit. p. 70. *L. anomaloides* f. *denigrans* Nyl. ex Cromb. Lich. Brit. p. 70; Leight. Lich. Fl. p. 315; ed. 3, p. 330.

Exsicc. Cromb. n. 177.

The hypothecium varies from almost colourless in a thin section to sordid-brownish; the epithecium is greenish-black or sordid-brown.

Hab. Overspreading decaying mosses on the ground or on rocks in an alpine situation.—*B. M.* Plentiful near the summit of Ben Lawers, Perthshire.

36. **B. confusior** A. L. Sm.—Thallus effuse, dark-grey, thin, cracked-areolate, the areolæ small, almost plane. Apothecia rather small, black, plane and obscurely margined, becoming convex or almost globose and immarginate; hypothecium colourless or yellowish; paraphyses not well discrete, rather stout, slightly thicker and blackish at the apices; spores ellipsoid or oblong, simple, then 1-septate, 0,010–17 mm. long, 0,004–6 mm. thick; hymenial gelatine deep blue then wine-red with iodine.—*Lecidea confusior* Nyl. in Flora lvii. p. 315 (1874); Cromb. in Grevillea iii. p. 24; Leight. Lich. Fl. ed. 3, p. 298.

Described by Nylander as having simple spores and as closely allied to *Lecidea confusula*. Examination of the specimen in the British Museum from the original locality shows that the spores are septate when mature.

Hab. On mica-schist rocks in a mountainous district.—*B. M.* Craig Tulloch, Blair Athole, Perthshire (the only locality).

37. **B. obturbans** A. L. Sm.—Thallus indeterminate, thin, rugose, unequal, greyish (K + yellowish, CaCl −); hypothallus black, limiting the thallus. Apothecia small, at first plane and thinly margined, becoming convex and immarginate, blackish, pale within; paraphyses not well discrete; epithecium and perithecium blackish; spores oblong, colourless, 0,010–11 mm. long, 0,0035 mm. thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea obturbans* Nyl. in Flora lxix. p. 100 (1886); Martind. in Naturalist, 1886, p. 101. Specimen not seen.

Hab. On schistose rocks. Collected by J. M. Martindale near Kendal, Westmoreland.

38. **B. subviridis** A. L. Sm.—Thallus effuse, thin, continuous, granulate-rugulose, somewhat shining, greenish or dark-green (K −, CaCl −). Apothecia sessile, minute, plane, thinly margined, black, whitish within; paraphyses moderate; epithecium brown; hypothecium colourless; spores oviform, 0,011–16 mm. long, 0,005–7 mm. thick; hymenial gelatine bluish then tawny-reddish with iodine.—*Lecidea subviridis* Nyl. in Flora lvi. p. 297 (1873); Cromb. in Grevillea ii. p. 91; Leight. Lich. Fl. ed. 3, p. 331.

Well characterized by the *Arthonia*-like spores; it is allied to *Lecidea arthoniza*, a Scandinavian species. In the two small specimens seen, the apothecia are only sparingly present.

Hab. On siliceous stones in a maritime district.—*B. M.* Noirmont Bay, Jersey (the only locality).

39. **B. supernula** A. L. Sm.—Thallus absent. Apothecia small, plane, and thinly margined, at length convex, immarginate, black, concolorous within; paraphyses moderate or rather thick, bluish-black at the clavate apices; hypothecium bluish-black, brick-red above; spores oblong-oviform, 0,009–14 mm. long, 0,004–5 mm. thick; hymenial gelatine wine-red with iodine.—*Lecidea supernula* Nyl. in Flora lix. p. 574 (1876); Cromb. in Grevillea v. p. 107; Leight. Lich. Fl. ed. 3, p. 389.

An athalline plant very similar in the form of the *Arthonia*-like spores to the preceding species. The apothecia are numerous and usually several (3–6, rarely 8) aggregate.

Hab. Parasitic on the thallus of *Lecanora calcarea* var. *Hoffmanni* in a maritime tract.—*B. M.* Island of Lismore, Argyll (the only locality).

40. **B. episema** A. L. Sm.—Thallus absent. Apothecia small, black, aggregate or solitary, plane or rarely convex, marginate, the margin obtuse, entire; hypothecium brown; paraphyses distinct, blackish at the tips of the clavate apices; spores ellipsoid or elongate-oblong, typically 1-septate, rarely 1–3-septate, 0,010–18 mm. long, 0,004–5 mm. thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea episema* Nyl. in Bot. Not. 1853,

p. 161; Cromb. Lich. Brit. p. 78: Leight. Lich. Fl. p. 356; ed. 3, p. 385.

Hab. Parasitic on the thallus of *Lecanora calcarea*.—*Distr.* Somewhat rare though widely distributed in the British Isles.—*B. M.* Near Yatton, Somerset; Barnsley Park and Cirencester, Gloucestershire; Aran Mawddwy, Merioneth; Trefriw and Great Orme's Head, Carnarvonshire; Craig Tulloch, Blair Athole, Perthshire; Cong, Lough Corrib, Galway.

41. **B. cristata** A. L. Sm.—No proper thallus. Apothecia black, very minute, solitary, or clustered, or in narrow flexuose lines, concave, the margin thick and obtuse; hypothecium black, carbonaceous; spores linear-oblong, minute, faintly 1-septate, 0,006–8 mm. long, 0,002–3 mm. thick.—*Lecidea cristata* Leight. Lich. Fl. p. 356 (1871); ed. 3, p. 385. Specimen not seen.

Hab. Parasitic on the thallus of *Lecanora subcarnea*.—*Distr.* Rare. found only in Wales (Barmouth, Merioneth).

42. **B. stereocaulorum** Th. Fr. Lich. Arct. p. 188 (1860).—Thallus absent. Apothecia parasitic, small, plane, at length convex, immarginate, black, blackish or pale, dark within; paraphyses clavate and yellowish-brown at the apices; hypothecium somewhat yellowish; spores oblong-fusiform (usually thicker above), 0,013–19 mm. long, 0,004–6 mm. thick; hymenial gelatine tawny-wine-red, the asci bluish and then violet at the apices, with iodine.—*Lecidea stereocaulorum* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. p. 182 (1866); Cromb. in Grevillea xxii. p. 11. Specimen not seen.

Hab. On the squamules of *Stereocaulon* in mountainous regions.

43. **B. epiblastematica** A. L. Sm.—Thallus effuse, thin, scattered, minutely granulate, whitish or obsolete. Apothecia small, at first subplane with paler margin, then convex and immarginate, sordid-pale-brown, at length blackish; paraphyses slightly incrassate at the apices; hypothecium colourless or brownish; spores fusiform-ellipsoid or ovoid, simple or 1-septate, 0,012–15 mm. long, 0,005–7 mm. thick; hymenial gelatine pale-bluish then wine-red with iodine.—*Peziza epiblastematica* Wallr. Fl. Crypt. Germ. ii. p. 464 (1833). *fide* Arnold ex Rehm in Rabenhorst's Krypt.-Fl. i. 3, p. 323 (1890). *Scutula Wallrothii* Tul. in Ann. Sci. Nat. ser. 3, xvii. p. 119, t. 14, figs. 14–24 (1852). *Biatora Heerii* Hepp in Schær. Lich. Helv. n. 630 (1852). *Lecidea Heerii* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. p. 150 (1866); Cromb. in Journ. Bot. xx. p. 275 (1882). *L. Wallrothii* Nyl. *l. c.*; Cromb. in Journ. Bot. xii. p. 148 (1874); Leight. Lich. Fl. ed. 3, p. 388.

In the few British specimens the thallus described by Nylander is entirely absent. The parasitic apothecia are either solitary or more frequently aggregate on the host. Small brick-red pycnidia also

occur with oblong, straight or slightly arcuate, simple or 1-septate stylospores 0,014–23 mm. long, 0,004 mm. thick (*vide* Nylander Lich. Env. Par. Suppl. p. 6 (1897)).

Hab. On the thallus of species of *Peltigera* and of *Solorina saccata* in subalpine tracts.—*B. M.* Craig Calliach and Ben Lawers, Perthshire.

74. **BILIMBIA** De Not. in Giorn. Bot. Ital. ii. p. 190 (1846). *Toninia* Massal. Ric. Lich. p. 107 (1852); Mudd Man. p. 173. (Pl. 11.)

Thallus minutely squamulose or variously crustaceous, sometimes obsolete. Algal cells, *Protococcus*. Apothecia light coloured or dark and carbonaceous, immarginate or with a proper margin only; spores usually 8 in the ascus, oblong or fusiform, 2- to pluri-septate, usually 3-septate, colourless.

1. **B. caradocensis** A. L. Sm. — Thallus effuse, minutely squamulose-granulose, rimose-areolate, pale-greyish- or greenish-olive (K+ yellow, CaCl + orange-yellow), the squamules adnate, convex, crowded, somewhat rugose, more or less crenulate at the margins. Apothecia very small, innate-sessile, margined, black, the margin thick, flexuose; hypothecium reddish- or dark-brown; paraphyses concrete, brown at the apices; spores ellipsoid-fusiform, 3-septate, 0,011–15 mm. long, 0,004–5 mm. thick; hymenial gelatine bluish with iodine.—*Lecidea caradocensis* Leight. ex Nyl. in Act. Soc. Linn. Bord. ser. 3, p. 383 (1856); Leight. in Ann. Mag. Nat. Hist. ser. 3, xiv. p. 404, t. 9, figs. 6, 7, 10 (1864) & Lich. Fl. p. 325; ed. 3, p. 344; Cromb. Lich. Brit. p. 92. *Psora caradocensis* Mudd Man. p. 169 (1861) pro parte.

Exsicc. Leight. n. 160; Cromb. n. 93; Johns. n. 395.

Externally resembling *Lecidea Friesii*. It is frequently sterile; the apothecia when present are numerous and often confluent and difform. The immature spores are sometimes only 1- or 2-septate.

Hab. On trunks of firs, more frequently on old palings.—*Distr.* Local but plentiful in S. and central England, rare in N. England.—*B. M.* Near Lyndhurst, Hants; Penshurst, Kent; near Reigate, Surrey; Hendon and near Mill Hill, Middlesex; near Highbeach, Epping Forest, Essex; Chalford, Gloucestershire; Windsor Great Park, Berkshire; near Elstree, Herts; Gopsall and Twycross, Leicestershire; near Upper Howell, Malvern, Worcestershire; Caer Caradoc, Shropshire; Park End, Wark-on-Tyne, Northumberland.

2. **B. aromatica** Jatta Syll. Lich. Ital. p. 402 (1900). — Thallus indeterminate, thickish, globulose-squamulose or granulose-congested, rugose, greyish-white (K−, CaCl−). Apothecia, small, subsessile, plane and thinly margined, at length convex and immarginate, black; hypothecium thick, reddish-brown, reddish-black in thick section; paraphyses somewhat lax, clavate and dark-greenish-blue at the apices; spores oblong-cylindrical, simple or thinly 3-septate, 0,013–25 mm. long, 0,004–6 mm. thick; hymenial gelatine deep-blue then wine-red with iodine.—

Lichen aromaticus Turn. in Sm. Engl. Bot. t. 1777 (1807). *Lecidea aromatica* Ach. Lich. Univ. p. 168 (1810); S. F. Gray Nat. Arr. i. p. 464; Hook. in Sm. Engl. Fl. v. p. 177; Cromb. Lich. Brit. p. 78 pro parte; Leight. Lich. Fl. p. 332; ed. 3, p. 352. *L. cœruleonigricans* var. *β aromatica* Tayl. in Mackay Fl. Hib. ii. p. 131 (1836)? *Toninia aromatica* Massal. Symm. Lich. p. 54 (1855); Mudd Man. p. 174, t. 3, f. 64.

Exsicc. Leight. n. 154; Larb. Cæsar. n. 85; Cromb. n. 180.

The name *aromatica* was given by Turner on account of the supposed fragrant scent of the plant when bruised, which however is a mistake. At times the thallus occurs in small scattered patches; the apothecia are often confluent and difform. The var. *hypsophila* Nyl. ex Cromb. Lich. Brit. p. 78 (1870), wrongly printed *hypnophila*, has a somewhat less developed thallus; it is found on rocks in alpine situations.

Hab. On the ground among calcareous rocks and on mortar of old walls in maritime and upland tracts.—*Distr.* Not unfrequent in England, rare in Scotland, Ireland, and the Channel Islands.—*B. M.* St. Aubin's Harbour, Jersey; Port Gorey, Sark; I. of Wight; Torquay and Bolt Head, Devon; near Penzance, Cornwall; Bathampton Hill, Somerset; Shoreham and Tillington, Sussex; Hempstead, Gloucestershire; Barmouth, Merioneth; Trefriw, Carnarvonshire; Oswestry, Llanymynech Hill and Llanforda, Shropshire; Tenby, Pembrokeshire; near Yarmouth, Norfolk; near Roseberry and Ayton, Cleveland, Yorkshire; Teesdale, Durham; near Appin House, Argyll; Craig Tulloch and Ben Lawers, Perthshire; Craig Guie, Braemar, Aberdeenshire; Cloghan near Kylemore, Connemara, Galway.

3. **B. carbonacea** Jatta Syll. Lich. Ital. p. 403 (1900).—Thallus brownish-black, suborbicular, rather thick, formed of minute convex entire or crenate wrinkled squamules, sometimes cracked-areolate. Apothecia small, black, solitary or aggregate, sessile with a prominent margin, becoming immarginate; hypothecium thick, reddish-black; paraphyses distinct, brownish or greenish-black at the clavate apices; spores linear-oblong, straight or curved, 3-septate, 0,015–22 mm. long, 0,004 mm. thick.—*Toninia carbonacea* Anzi Cat. Lich. Sondr. p. 68 (1860). *Lecidea aromatica* subsp. *carbonacea* Cromb. Lich. Brit. p. 78 (1870). *L. carbonacea* Leight. Lich. Fl. p. 331; ed. 3, p. 351.

Differs from *B. aromatica* in the form and colour of the thallus, and in the darker-coloured epithecium.

Hab. On rocks.—*Distr.* Rare in mountainous regions in N. Scotland and W. Ireland.—*B. M.* Ben Lawers, Perthshire; Achosragan Hill, Appin, Argyll; Craig Guie, Braemar, Aberdeenshire.

4. **B. squamulosa** A. L. Sm.—Thallus subdeterminate, thick or thinnish, squamulose, appressed, pale- or tawny-brown; squamules small, subimbricate, angular, crenate at the margins (K−, CaCl−). Apothecia small, innate-sessile, at first plane and thinly margined, then convex and immarginate, black; paraphyses slender, bluish-black at the slightly clavate apices;

hypothecium thick, reddish-black; spores fusiform-cylindrical, 3-septate, 0,015–18 mm. long, 0,004–5 mm. thick; hymenial gelatine bluish then tawny-wine-red with iodine. — *Toninia squamulosa* Mudd Man. p. 174 (1861). *Lecidea squamulosa* Deakin ex Mudd *l. c.*; Cromb. Lich. Brit. p. 79; Leight. Lich. Fl. p. 331; ed. 3, p. 353.

Exsicc. Larb. Lich. Hb. n. 181.

Found originally by Salwey and partly described without name in Trans. Penzance Nat. Hist. Soc. 1853, p. 144, where he says that in age the squamules become flat, noncrenate, and lighter in colour. The numerous apothecia are either solitary or several congregate.

Hab. On rocks, walls, and the soil in crevices, in maritime rarely upland hilly districts.—*Distr.* Rather local in England, rare in N.E. Scotland, Ireland, and the Channel Islands.—*B. M.* Port Gorey, Sark; above Anstey's Cove, Torquay, and near Kingsbridge, Devon; near Truro, near Trengwainton, and at Madron Union, Penzance, Cornwall; Bathampton Hill, Somerset; Malvern Hills; Worcestershire; Barmouth, Merioneth; Craigforda and Llanymynech, Shropshire; Slaghead Kirk, near Stonehaven, Kincardineshire; Craig Tulloch, Blair Athole, Perthshire; Blackwater, Kerry; Lettermore, Connemara, Galway.

5. **B. mesoidea** A. L. Sm.—Thallus subdeterminate, subopaque, unequal, subareolate-rimose, greyish or greyish-brown (K−, CaCl−). Apothecia moderate, at first thinly margined, then convex, immarginate, black; paraphyses slender, blackish at the clavate apices; hypothecium thick, reddish-black, the inner layer of perithecium and base of hymenium yellowish-red; spores oblong, 3-septate, 0,014–20 mm. long, about 0,004–6 mm. thick; hymenial gelatine bluish then violet-coloured with iodine. —*Lecidea mesoidea* Nyl. in Flora li. p. 475 (1868); Leight. in Ann. Mag. Nat. Hist. ser. 4, iii. p. 268 (1869) & Lich. Fl. p. 333; ed. 3, p. 350; Cromb. Lich. Brit. p. 78. *L. subimbricata* Nyl. in Flora lx. p. 460 (1877); Cromb. in Grevillea vi. p 112; Leight. Lich. Fl. ed. 3, p. 350.

Intimately related to the preceding, but differs in the more crustaceous thallus, the darker epithecium and the rather thicker spores. According to Nylander it approaches *Lecidea acclinis* Flot., a corticolous plant not found in Britain. In our specimen of *L. subimbricata* the thallus is thicker and generally darker owing to the presence of some blue-green alga; the specimen was collected in a moist situation.

Hab. On granitic and schistose rocks in maritime localities.—*Distr.* Found only very sparingly in the Channel Islands, S. Wales, and N.W. Ireland.—*B. M.* Fliquet Bay, Jersey; Sark; Killery Bay and Kylemore Lake, Connemara, Galway.

6. **B. sabulosa** Massal. Ric. Lich. p. 122, fig. 239 (1852). — Thallus determinate, thickish, granulose-squamulose, the squamules small, more or less concrescent and crenate-lobulate, greyish-white, greyish-brown, or cream-coloured (K−, CaCl−).

Apothecia sessile, aggregate, at first somewhat plane and thinly margined, at length hemispherical and immarginate, blackish-brown or black; paraphyses concrete, bluish-green at the apices; hypothecium brownish-black; spores ellipsoid or oblong-fusiform, 1–3-septate, 0,014–24 mm. long, 0,003–6 mm. thick; hymenial gelatine bluish then sordid-violet with iodine. — Mudd Man. p. 188. *Lecidea sabuletorum* var. *syncomista* Floerke in Berl. Mag. p. 310 (1808); f. *syncomista* Cromb. Lich. Brit. p. 71 (1870). *L. milliaria* var. *syncomista* Leight. Lich. Fl. p. 339 (1871); ed. 3, p. 362. *L. syncomista* Cromb. in Grevillea i. p. 172 (1873).

Exsicc. Larb. Cæsar. n. 82 & Lich. Hb. n. 315; Cromb. n. 176.

Hab. On sandy ground and on soil in crevices of rocks in maritime and upland tracts.—*Distr.* Local and scarce in England, Wales, and the Channel Islands; more frequent on the Grampians, Scotland; not seen from Ireland.—*B. M.* Quenvais, Jersey; Thetford Warren, Norfolk; Black Dale, near Buxton, Derbyshire; Cader Idris, Merioneth; Pentregaer, Oswestry, Shropshire; Achosragan Hill, Appin and I. of Lismore, Argyll; Craig Calliach, Loch-na-gat, Ben Lawers and Craig Tulloch, Perthshire; Craig Guie and Morrone, Braemar, Aberdeenshire.

Var. **perpallescens** A. L. Sm.—Thallus squamulose, greyish-white, the squamules paler at the margins. Apothecia pale or pale-brick-red.—*Lecidea syncomista* subsp. *perpallescens* Nyl. in Flora lxii. p. 361 (1879); Cromb. in Grevillea viii. p. 112.

Differs from the type in the constantly paler thallus and apothecia.

Hab. On the soil in crevices of calcareous rocks in a maritime district.—*B. M.* I. of Lismore, Argyll.

Var. **montana** A. L. Sm.—Thallus effuse, thin, greyish or whitish, granulose. Apothecia aggregate, immarginate; hypothecium thick, black; paraphyses dark-bluish-green or black; otherwise as in the type.—*Lecidea vernalis* var. *montana* Nyl. in Act. Soc. Linn. Bord. ser. 3, i. p. 354 (1856). *L. sabuletorum* f. *montana* Nyl. Lich. Scand. p. 205 (1861); Cromb. Lich. Brit. p. 71. *L. milliaria* var. *montana* Leight. Lich. Fl. p. 339 (1871); ed. 3, p. 362 pro parte.

Differs from the type in the thinner more finely granular thallus, and the internally blacker apothecia.

Hab. On the ground incrusting mosses.—*Distr.* Rare in alpine situations.—*B. M.* Ben Lawers, Perthshire; Ben-naboord, Aberdeenshire.

7. **B. squalida** Jatta Syll. Lich. Ital. p. 403 (1900).—Thallus subdeterminate, squamulose-concrescent, plicate-wrinkled, the squamules sublobulate, often pulvinate, tawny, or greyish-brown (K−, CaCl−). Apothecia small, adnate, plane and thinly margined, then convex and immarginate, black; hypothecium

colourless or brownish; paraphyses coherent, dark-brown or greenish-blue at the clavate apices; spores cylindrical or fusiform-cylindrical, simple or 3-septate, 0,018–36 mm. long, 0,004–5 mm. thick; hymenial gelatine bluish then wine-red with iodine.—*Lichen squalidus* Schleicher in Schrad. Neu. Journ. Bot. i. 2, p. 199 (1806) nomen. *Lecidea squalida* Ach. Lich. Univ. p. 169 (1810); Cromb. in Journ. Bot. xi. p. 136 (1873); Leight. Lich. Fl. ed. 3, p. 358.

The thallus varies in thickness and sometimes occurs in small orbicular patches; the apothecia are numerous and become subglobose and conglomerate.

Hab. On mosses chiefly Andreæas, and on calcareous soil in mountainous regions.—*Distr.* Rare on the Grampians, Scotland.—*B. M.* Above Loch-na-gat, Ben Lawers, Perthshire; Craig Guie, Braemar, Aberdeenshire; Barcaldine, Argyll.

8. **B. candida** A. L. Sm.—Thallus glaucous-white, tartareous, warted-areolate, turgid, sublobate (K−, CaCl−). Apothecia minute, solitary or confluent, sessile, black, plane or convex, marginate; hypothecium thick, black; spores linear-cylindrical or fusiform, 3-septate sometimes 2- or 4-septate, 0,015–16 mm. long, 0,0035 mm. thick.—*Lichen candidus* Sm. Engl. Bot. t. 1138 (1803). *Lecidea Turneri* Leight. Lich. Fl. p. 330 (1871); ed. 3, p. 353.

I have examined the specimen of *Lichen candidus* in the Sowerby herbarium, said by Leighton to be synonymous with his *L. Turneri*, and have been unable to find spores; the hypothecium is thick and dark, becoming a greenish-brown colour in the hymenium; the paraphyses are slender and closely coherent. There is no other specimen in the British Museum.

Hab. On mortar in walls, etc.—*Distr.* S. and central England.—*B. M.* Near Yarmouth, Norfolk.

9. **B. sphæroides** Koerb. Syst. Lich. Germ. p. 213 (1855) excl. syn.—Thallus effuse, granulose-subpulverulent, greyish- or greenish-white (K−, CaCl−). Apothecia moderate, sessile, pale-yellow, at first plane with thickish, paler margin, at length convex, subglobose, immarginate; paraphyses concrete, colourless or very pale-yellowish; hypothecium pale; spores oblong-fusiform, 3-septate, 0,015–21 mm. long, 0,005–7 mm. thick; hymenial gelatine pale-bluish then deep wine-red with iodine.—*Lichen sphæroides* Dicks. Crypt. fasc. i. p. 9, t. 2, f. 2 (1785); With. Arr. ed. 3, iv. p. 15. *Lecidea sphæroides* Sommerf. Suppl. Fl. Lapp. p. 164 (1826); S. F. Gray Nat. Arr. i. p. 474; Cromb. Lich. Brit. p. 70; Leight. Lich. Fl. p. 336; ed. 3, p. 357.

There is a wide variation in the form and septation of the spores, from short, 1-septate and almost pyriform to oblong, narrowly fusiform and 3-septate.

Hab. On trees, on mosses on trees, and on the ground.—*Distr.* Rare throughout the British Isles.—*B. M.* St. Minver, Cornwall;

Cliffrigg, Cleveland, Yorkshire; Ben Lawers, Perthshire; Craig Cluny, Braemar, Aberdeenshire; Letterfrack, Connemara, Galway.

Var. **alabastrites** A. L. Sm.—Thallus effuse, thin, continuous, minutely subgranulose, whitish or greenish-white. Apothecia small, somewhat plane, whitish, colourless within, the margin scarcely prominent, somewhat paler; paraphyses not discrete; epithecium and hypothecium colourless; spores fusiform, 3–5-septate, 0,018–24 mm. long, 0,005–7 mm. thick; hymenial gelatine bluish then, especially the asci, dark-wine-coloured with iodine.—*Lecidea alabastrites* Nyl. in Flora lxii. p. 207 (1879); Cromb. in Grevillea viii. p. 29.

Exsicc. Larb. Lich. Hb. without number.

Resembles the type in external appearance, differing only in the somewhat more regular and larger spores, usually 3- or more-septate. In the specimen examined from the original locality the apothecia are somewhat yellow internally, but that is probably only a condition of age or growth.

Hab. On moss on trees.—*B. M.* Derryclare, Kylemore, Connemara, Galway.

10. **B. Nægelii** Anzi in Flora xliv. p. 653 (1861).—Thallus effuse, thin, unequal, granulose or rimulose, greyish or whitish (K−, CaCl−). Apothecia minute, adnate or sessile, subconcave or plane and thinly margined, then convex and immarginate, leaden-brownish or flesh-coloured; hypothecium colourless; paraphyses coherent, leaden-brownish or dark at the apices; spores 6–8 in the ascus, oblong, straight or slightly curved, simple or usually 3-septate, 0,014–25 mm. long, 0,004–6 mm. thick; hymenial gelatine bluish then sordid-tawny-wine-coloured with iodine.—*Biatora Nægelii* Hepp Flecht. Eur. n. 19 (1853). *Lecidea Nægelii* Stiz. in Nov. Act. Acad. Leop.-Carol. xxxiv. Abh. 2, p. 19 (1867); Cromb. in Journ. Bot. xiv. p. 361 (1876); Leight. Lich. Fl. ed. 3, p. 345. *L. sphæroides* f. *vacillans* Nyl. Lich. Scand. p. 204 (1861) pro parte; Leight. Lich. Fl. p. 336.

Exsicc. Larb. Lich. Hb. n. 175.

When moistened the apothecia show a pale transparent disc, surrounded by a darker ring.

Hab. On the bark of trees.—*Distr.* Rare in S. England and W. Ireland.—*B. M.* Near Erriff, Connemara, Galway.

11. **B. metamorphea** Oliv. Exp. Syst. Lich. France ii. fasc. 1, p. 40 (1900).—Thallus effuse, thin, leprose, greenish or greyish-green. Apothecia small or submoderate, innate, somewhat plane, at times difform or 2-confluent, the margin obliterated, whitish or pale-flesh-coloured, concolorous within; asci oblong, crowded; paraphyses none; spores oblong or oblong-fusiform simple or 3-septate, 0,019–32 mm. long, 0,006–8 mm. thick; hymenial gelatine scarcely tinged, the asci bluish then wine-reddish, with iodine.—*Lecidea metamorphea* Nyl. in Act. Soc. Linn. Bord.

ser. 3, i. p. 359 (1856); Cromb. in Grevillea i. p. 172; Leight. Lich. Fl. ed. 3, p. 355.

Hab. On mosses on stones, in a mountainous district.—*B. M.* Glen Fender, Blair Athole, Perthshire (the only locality).

12. **B. hyalinescens** Boist. Nouv. Fl. Lich. pt. 2, p. 188 (1902).—Thallus effuse, very thin, subfurfuraceous, greyish-white, at times scarcely distinct. Apothecia appressed, moderate or somewhat large, crowded, concave, pale-sordid-rose or clear-horn-coloured, the margin thick, persistent, yellowish-horn-coloured, slightly pulverulent; hypothecium colourless; paraphyses very slender; spores oblong-fusiform, 3-septate, 0,016–18 mm. long, 0,005 mm. thick; hymenial gelatine not tinged, the asci tawny-wine-red, with iodine.—*Lecidea hyalinescens* Nyl. in Act. Soc. Linn. Bord. ser. 3, i. p. 355 (1856); Leight. Lich. Fl. ed. 3, p. 356.

Exsicc. Larb. Lich. Hb. n. 107.

Resembles a *Gyalecta* in the paler prominent margin of the apothecia.

Hab. On rocks.—*B. M.* Overspreading mossy stone on bank of torrent, Twelve Pins, Connemara, Galway.

13. **B. cuprea** Massal. in Lotos p. 77 (1856).—Thallus effuse, greenish, whitish or copper-coloured, finely granular, becoming areolate. Apothecia minute, dark or light-brownish, often with a dark margin, becoming flattened, chestnut-brown or reddish-yellow and immarginate; hypothecium colourless; paraphyses subdiscrete, colourless; spores linear- or fusiform-elliptical, 1–3-septate, 0,015–30 mm. long, 0,002–4 mm. thick; hymenial gelatine blue with iodine.—*Lecidea cupreorosella* Nyl. in Mém. Sóc. Sci. Nat. Cherb. v. p. 122 (1857); Cromb. Lich. Brit. p. 68; Leight. Lich. Fl. p. 335; ed. 3, p. 358. *L. luteorosella* Nyl. ex Leight. Lich. Fl. ed. 3, p. 340 (1879).

Distinguished by the minute usually punctiform and rather dark-coloured apothecia. The spores vary considerably in size and form and in all of our specimens of this and the allied species the paraphyses are more or less clavate or swollen at the tips. Stizenberger notes (Nov. Act. Acad. Leop.-Carol. xxxiv. Abh. 2, p. 9 (1867)) that the thallus varies with the locality and in shady situations is greyish-green or orange.

Hab. On rocks.—*Distr.* Rare in N. England and W. Ireland.—*B. M.* Bilsdale, Yorkshire; Twelve Pins, Connemara, Galway.

14. **B. albidocarnea** A. L. Sm.—Thallus effuse, thin, unequal, rimulose-diffract, whitish or glaucous-white (K−, CaCl−). Apothecia moderate, superficial, plane or somewhat convex, immarginate, pale-flesh-coloured, white within; paraphyses subdiscrete, clavate at the apices; epithecium and hypothecium colourless; spores fusiform-ellipsoid or fusiform-oblong, 1–3-septate, 0,010–18 mm. long, 0,0035–45 mm. thick; hymenial

gelatine slightly bluish then wine-reddish with iodine.—*Lecidea albidocarnea* Nyl. in Flora lx. p. 459 (1877); Cromb. in Grevillea vi. p. 111; Leight. Lich. Fl. ed. 3, p. 346.

Similar to the preceding but differs in the large apothecia which are pale-coloured from the beginning, and in the usually stouter spores.

Hab. On mica-schist rocks.—*B. M.* Ballynahinch, Galway (the only locality).

Var. **albovirella** A. L. Sm.—Thallus effuse, thin, subleprose, continuous, bright-green, at times nearly evanescent, otherwise as in the species.—*Lecidea albovirella* Nyl. in Flora lx. p. 567 (1877); Cromb. in Grevillea vi. p. 112; Leight. Lich. Fl. ed. 3, p. 356.

Exsicc. Larb. Lich. Hb. without number.

Hab. On a shady schistose rock of a ravine in a mountainous district.—*B. M.* Above Lough Feagh, Connemara, Galway (the only locality).

Var. **alborubella** A. L. Sm.—Thallus effuse, very thin, or evanescent, whitish or greenish-white (K−, CaCl−). Apothecia small, convex, immarginate, yellow- or reddish-flesh-coloured, within colourless; paraphyses slender, clavate at the apices; epithecium and hypothecium colourless; spores linear- or fusiform-oblong, 3-septate, thinner than in the species, 0,014–21 mm. long, 0,002 mm. thick; hymenial gelatine tawny-wine-reddish with iodine.—*Lecidea alborubella* Nyl. in Flora lxii. p. 205 (1879); Cromb. in Grevillea vii. p. 28.

Nylander observes that while the thalline gonidia are normal (glomerulose), there are also present hymenial gonidia consisting of cylindrical erect syngonidia,—a not unfrequent occurrence in species of this order. In the two specimens seen, which are very sparingly fertile, the thallus is little visible, being for the most part overrun by a *Lepraria*.

Hab. On calcareous rocks in a cave in a maritime locality.—*B. M.* Derryclare, Connemara, Galway (the only locality).

Subsp. **chlorotropoides** A. L. Sm.—Thallus effuse, very thin, subleprose, greenish (K−, CaCl−). Apothecia minute, margined, reddish-yellow, the margin usually darker; perithecium violet in thin section; hypothecium often pale-violet; paraphyses subdiscrete, clavate at the apices; spores fusiform-oblong, 1–3-septate, 0,014–20 mm. long, 0,002–3 mm. thick; hymenial gelatine bluish, the asci wine-red with iodine.—*Lecidea chlorotropoides* Nyl. in Flora lx. p. 567 (1877); Cromb. in Grevillea vi. p. 112; Leight. Lich. Fl. ed. 3, p. 346.

Subsimilar to the species, but differs in the colour of the apothecia and in that of the excipulum and hypothecium. In our specimen collected by Larbalestier the few apothecia are ochraceous or somewhat reddish-yellow and immarginate. The spores are narrow and become 3-septate when mature. One of the two specimens from Kylemore is

associated with minute patches of a bright purple alga, which may explain the sometimes pale-violet colour of the hypothecium.

Hab. On shady calcareous rocks in a maritime district.—*B. M.* Kylemore, Connemara, Galway (the only locality).

15. **B. herbidula** A. L. Sm.—Thallus effuse, thinnish, subleprose, rimulose or rimulose-diffract, opaque, yellowish-green (K + yellowish, CaCl −). Apothecia minute, plane or somewhat convex, pale-reddish, pale within, the margin thin, darker; paraphyses not well discrete; epithecium and hypothecium colourless; spores fusiform, 1–3-septate, 0,011–18 mm. long, 0,0025 mm. thick; hymenial gelatine bluish with iodine.—*Lecidea herbidula* Nyl. in Flora lx. p. 563 (1877); Cromb. in Grevillea vi. p. 112; Leight. Lich. Fl. ed. 3, p. 357.

A doubtful species perhaps referable to *B. cuprea.* Nylander has described the thallus as having the characters of *Gongrosira* Kuetz. with subchroolepoid filaments containing numerous large rotundate greenish granules. Our specimen consists of a dense layer of cells of some Palmellaceous alga; I have been unable to find any apothecia.

Hab. On a schistose rock in a maritime district.—*B. M.* Kylemore, Connemara, Galway (the only locality).

16. **B. byssoboliza** A. L. Sm.—Thallus indeterminate, very thin, continuous, opaque, greenish or greyish-green. Apothecia small, somewhat prominent, yellow-flesh-coloured, concolorous within, the margin paler, at length undulate or scarcely distinct, with a white, pubescent base; paraphyses slender, discrete; epithecium and hypothecium colourless; spores fusiform, 3–5-septate, 0,023–27 mm. long, 0,003–4 mm. thick; hymenial gelatine pale-bluish then tawny-wine-coloured with iodine.—*Lecidea byssoboliza* Nyl. in Flora lxii. p. 206 (1879); Cromb. in Grevillea xxii. p. 58.

Exsicc. Larb. Lich. Hb. n. 267.

Readily recognized by the pubescence at the base of the apothecia. The specimen seen is only sparingly fertile.

Hab. In damp recesses of rocks and walls in a maritime district.—*B. M.* Killery Bay, Connemara, Galway (the only locality).

17. **B. hemipolioides** A. L. Sm.—Thallus effuse, thin or very thin, rugulose, subopaque, greyish-green. Apothecia small, sessile, convex, immarginate, leaden-coloured or partly pale, colourless within; paraphyses slender, not well discrete, much branched; epithecium and hypothecium colourless; spores fusiform-oblong, usually somewhat curved, 3-septate, 0,012–18 mm. long, 0,0045 mm. thick; hymenial gelatine bluish then, especially the asci, tawny-wine-red with iodine.—*Lecidea hemipolioides* Nyl. in Flora lvi. p. 294 (1873); Cromb. in Journ. Bot. xii. p. 148 (1874); Leight. Lich. Fl. ed. 3, p. 356.

Exsicc. Larb. Lich. Hb. n. 347.

Hab. On rocks.—*B. M.* Rozel, Jersey (the only locality).

18. **B. Nitschkeana** Lahm in Rabenh. Exs. no. 583 (1861).—Thallus effuse, thin, leprose or granulose, greyish-green or greenish-yellow (K−, CaCl−), often nearly evanescent. Apothecia minute, sessile or adnate, convex, immarginate, pale-leaden-brown or blackish; hypothecium colourless; paraphyses scanty, flexuose, and branched, subdiscrete; spores oblong or fusiform-ellipsoid, 3-septate, 0,012–20 mm. long, 0,003–4 mm. thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea Nitschkeana* Stiz. in Nov. Act. Acad. Leop.-Carol. xxxiv. Abh. 2, p. 70 (1867); Cromb. in Grevillea xxii. p. 58. *L. spododes* Nyl. in Flora lii. p. 410 (1869); Cromb. in Journ. Bot. vii. p. 233 (1869) & Lich. Brit. p. 70; Leight. Lich. Fl. p. 261; ed. 3, p. 257.

Hab. On old palings.—*Distr.* Rare in the South of England and in Wales.—*B. M.* Lyndhurst, New Forest, Hants; Dolgelly, Merioneth.

19. **B. sabuletorum** Branth & Rostr. in Bot. Tidsskr. iii. p. 229 (1869), excl. vars. b & c.—Thallus effuse, thin or very thin, granulose or leprose, sordid-greyish, or whitish (K−, CaCl−). Apothecia rather small, sessile, at first subplane and thinly margined, then convex and immarginate, pale-brown or brownish-black, pale within; paraphyses concrete, brownish at the apices; hypothecium colourless, brownish above; spores fusiform, 3–7-septate, 0,018–34 mm. long, 0,006–8 mm. thick; hymenial gelatine deep-blue then dark-violet or tawny-wine-red with iodine.—*B. sphæroides* Mudd Man. p. 187 (1861) (non Koerb.). *Lichen viridescens* Sm. Engl. Bot. t. 2217 (1810) (non Schrad.). *Lecidea sabuletorum* Floerke in Berl. Mag. 1808, p. 309 pro parte; Nyl. in Journ. Linn. Soc. ix. p. 254 (1867); Cromb. Lich. Brit. p. 71 (excl. vars.) & in Grevillea xxii. p. 57; Leight. Lich. Fl. p. 338; ed. 3, p. 364. *L. hypnophila* Turn. ex Ach. Lich. Univ. p. 199 (1810). *L. viridescens* Hook. in Sm. Engl. Fl. v. p. 180 (1833) (non Ach.). *L. subretusa* Stirton in Grevillea iii. p. 24 (1874) (*fide* Cromb. in Grevillea iii. p. 143); Leight. Lich. Fl. ed. 3, p. 366.

Exsicc. Leight. n. 91; Mudd n. 154; Cromb. n. 175; Larb. Lich. Hb. nos. 35, 36, 37; Larb. Cæsar. n. 81; Johns. n. 339.

Hab. Incrusting mosses on rocks, old walls, and decayed trunks of trees in maritime but chiefly upland tracts.—*Distr.* Widely distributed in Great Britain, and usually plentiful where it occurs; apparently rare in W. Ireland.—*B. M.* Jersey; Cobo and St. Martin's, Guernsey; Shanklin Downs, I. of Wight; Wadebridge, Newlyn Cliff and St. Breock, Cornwall; Dittisham Cross, near Dartmouth and Totnes, Devon; Bathampton Downs, Somerset; Amberley and near Cirencester, Gloucestershire; Preston, Shoreham and Henfield Common, Sussex; Broomfield, Essex; Norton, near Worcester; Ludlow, Farlow, Oswestry and Condower Park, Shropshire; Tenby, Pembrokeshire; Bridge End, Glamorganshire; Nannau and Dolgelly, Merioneth; Chirk, Denbigh; Kildale, Cleveland, Yorkshire; Teesdale, Durham; Heversham Head, Westmoreland; Canlochan Glen, Forfarshire; Killin, Craig Tulloch, Blair Athole and Ben Lawers, Perthshire;

Achosragan, Appin, Argyll; Craig Cluny, Braemar and Cults, Aberdeenshire; Glen Nevis, Invernessshire; Dinish, Killarney, Kerry; Balinakill, Connemara, Galway.

Var. **simplicior** A. L. Sm.—Externally similar to the type. Apothecia internally brownish-yellow; spores very variable in form and size, oblong, or somewhat clavate, acute at one end, usually 1-septate, sometimes 2- or 3-septate, 0,011–18 mm. long, 0,004–5 mm. thick.—*Lecidea sabuletorum* f. *simplicior* Nyl. Lich. Scand. p. 205 (1861); var. *Dufourei* Cromb. Lich. Brit. p. 71 (1870); Leight. Lich. Fl. p. 338; ed. 3, p. 364; var. *monophragmia* Nyl. ex Cromb. *l. c.*; Leight. *ll. c.* *L. Dufourei* Ach. ex Nyl. in Flora l. p. 373 (1867).

Differs in the form of the spores.

Hab. Incrusting mosses on rocks.—*Distr.* Rare in high altitudes.—*B. M.* Cader Idris, Merioneth; Ben Lawers, Perthshire.

Var. **obscurata** A. L. Sm.—Thallus effuse, thin, granulose, greyish-white or greyish. Apothecia moderate in size, sessile, concave and thickly margined, at length convex and immarginate, brown, reddish-brown, or blackish, pale within; paraphyses loosely coherent; epithecium and hypothecium yellowish-brown; spores ellipsoid or subfusiform, 3-septate, 0,015–30 mm. long, 0,005–8 mm. thick; hymenial gelatine bluish then dark-violet or wine-red with iodine.—*Lecidea sphæroides* var. *β obscurata* Sommerf. Fl. Lapp. Suppl. p. 165 (1826). *L. sabuletorum* f. *triplicans* Nyl. Lich. Scand. p. 205 (1861). *L. triplicans* Nyl. Lich. Fret. Behring. p. 24 (1888); Cromb. in Grevillea xxii. p. 57.

The apothecia are larger and darker than those of the species; they are very plentiful in our single specimen.

Hab. On mosses on rocks and on trees.—*B. M.* On mossy boulders, Morrone, Braemar, Aberdeenshire.

Var. **septenaria** A. L. Sm.—Thallus effuse, greyish-green. Apothecia convex, brownish or pale-leaden-coloured; hypothecium brownish; paraphyses colourless, rather stout, subconcrete, septate and somewhat clavate at the tips; spores fusiform, 5–7-septate, 0,017–34 mm. long, 0,006–7 mm. thick.—*Lecidea metamorphea* var. *septenaria* Nyl. in Flora lix. p. 239 (1876); Leight. Lich. Fl. ed. 3, p. 356.

Distinguished from *B. metamorphea* by presence of paraphyses. In habit and general appearance it resembles *B. sabuletorum*, differing only in the somewhat peculiar paraphyses.

Hab. On decaying mosses in fissures of rocks.—*B. M.* Near Kylemore, Connemara, Galway (the only locality).

Subsp. **lubens** A. L. Sm.—Thallus effuse, thinnish, granulose, greyish-glaucous. Apothecia small, subplane, then convex and immarginate, pale-flesh-coloured or leaden-brown; paraphyses

coherent; epithecium colourless; hypothecium brownish; spores very variable, 5–9-septate, 0,028–50 mm. long, 0,007–11 mm. thick; hymenial gelatine deep-blue with iodine.—*Lecidea lubens* Nyl. in Flora lvii. p. 311 (1874); Cromb. in Grevillea iii. p. 23; Leight. Lich. Fl. ed. 3, p. 366.

Differs in the usually lighter coloured apothecia and the larger spores.

Hab. On trunks of trees.—*B. M.* Shiere, Surrey (the only locality).

20. **B. subviridescens** A. L. Sm.—Thallus effuse, very thin, greenish or sordid-greenish, opaque, often obsolete. Apothecia small, convex, immarginate, brown or livid-brown, opaque, dark within; paraphyses coherent; epithecium and hypothecium pale or brownish; spores oblong, simple or 1–3-septate, 0,011–18 mm. long, 0,004–6 mm. thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea subviridescens* Nyl. in Flora li. p. 474 (1868); Leight. in Ann. Mag. Nat. Hist. ser. 4, iii. p. 267 (1869) & Lich. Fl. p. 324; ed. 3, p. 344; Cromb. Lich. Brit. p. 71.

Characterized by the darker, thinner thallus, the darker apothecia and the smaller spores.

Hab. Incrusting mosses or on the ground.—*Distr.* Somewhat rare in the Channel Islands and S. England.—*B. M.* Boulay Bay, Jersey; Ventnor, I. of Wight.

Var. **trisepta** A. L. Sm.—Thallus subdeterminate or effuse, very thin, subgranulose, dark-greyish or blackish, at times nearly obsolete. Apothecia minute, irregularly congregate, black; hypothecium colourless; spores obtusely fusiform, 3-septate, 0,0014–22 mm. long, 0,004–5 mm. thick; hymenial gelatine bluish then, especially the asci, violet or wine-reddish with iodine.—*Biatora trisepta* Næg. ex Muell. in Mém. Soc. Phys. Hist. Nat. Genev. xvi. p. 404 (1862) *fide* Th. Fr. Lich. Scand. p. 382 (1874). *Lecidea ternaria* Nyl. in Flora lx. p. 232 (1877); Leight. Lich. Fl. ed. 3, p. 358; Cromb. in Grevillea xxii. p. 58. *Lecidea sabuletorum* var. *milliaria* f. *ternaria* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. p. 151 (1866).

Exsicc. Mudd n. 157; Larb. Lich. Hb. without number.

Differs from the type in the darker thallus, and the somewhat smaller constantly 3-septate spores.

Hab. On moss and stones.—*Distr.* Rare throughout the British Isles.—*B. M.* Baysdale Moor and Lounsdale, Cleveland, Yorkshire; I. of Lismore, Argyll; Doughruagh Mt., and near Kylemore, Connemara, Galway.

21. **B. lignaria** Massal. Ric. Lich. p. 121 (1852) pro parte.—Thallus effuse, granulose or subpulverulent, thinnish, greyish-green or whitish or almost obsolete (K + yellowish, CaCl + reddish). Apothecia small, sessile or adnate, convex, hemi-

spherical, immarginate, somewhat shining or opaque, blackish; paraphyses concrete, dark-greenish-blue or dark-olivaceous at the apices; hypothecium pale- or sordid-brown; spores oblong or narrowly oblong-fusiform, straight or slightly curved, 3–7-septate, 0,016–32 mm. long, 0,005–7 mm. thick; hymenial gelatine bluish, the asci at length dark, with iodine.—*B. milliaria* Koerb. Syst. Lich. Germ. p. 214 (1855); Mudd Man. p. 188. *Lecidea lignaria* Ach. in Vet. Acad. Handl. 1808, p. 236 & Lich. Univ. p. 169. *L. milliaria* Fr. in Vet. Acad. Handl. 1822, p. 255; Leight. Lich. Fl. p. 338 pro parte (incl. f. *lignaria* & f. *saxigena*); ed. 3, p. 362 pro parte; Cromb. in Grevillea xxii. p. 58. *L. geomœa* Tayl. in Mackay Fl. Hib. ii. p. 124 (1836). *L. uliginosa* var. *geomœa* Ach. Meth. p. 43 (1803). *L. sabuletorum* var. *milliaria* Cromb. Lich. Brit. p. 71 (1870).

Exsicc. Mudd nos. 156, 158; Leight. nos. 210, 238, 386, 388; Larb. Lich. Hb. 272; Bohl. n. 85; Johns. n. 375 (as *Lecidea Turneri*).

Externally well characterized by the very numerous small often crowded or confluent apothecia, and also by their internal structure. The thallus varies somewhat in colour and form according to the habitat. *Lecidea saxigena* Uloth ex Leight. Lich. Fl. ed. 3, p. 363 is incompletely described, but is evidently a saxicolous condition of this species. It is recorded from Wales and N.W. Ireland.

Hab. On the ground, usually incrusting mosses, rarely on old palings, rocks, and stones from maritime to alpine situations.—*Distr.* Somewhat local in Great Britain and Ireland, but usually plentiful where it occurs; very rare and only saxicolous in the Channel Islands. —*B. M.* Rozel, Jersey; Epping Forest, Essex; Toy Hill, Kent; Leith Hill, Surrey; Fairlight Glen, Hastings, Lavington and Chillington Common, Sussex; near Lyndhurst, New Forest, Hants; Dartmoor, Devon; near Penzance, Cornwall; Buxton, Derbyshire; Neescliff Hill, Shropshire; Llyn Howel, Dolgelly and Cader Idris, Merioneth; Glyder Fawr, Carnarvonshire; Glandwr, Carmarthenshire; Baysdale and Guisboro' Moor, Cleveland, Yorkshire; Ben Cruachan, Argyll; Crianlarich, Craig Calliach and Ben Lawers, Perthshire; Banchory Devenick, near Aberdeen, Craig Guie, Braemar, Aberdeenshire; near Belfast, Antrim; Doneraile Mts., Cork; Dunkerron and Killarney, Kerry; near Kylemore, Galway.

Form **nigrata** A. L. Sm.—Thallus dark, scarcely visible; hypothallus blackish, predominating. Apothecia black; spores fusiform, 0,030–40 mm. long, 0,007 mm. thick.—*Lecidea sabuletorum* var. *milliaria* f. *nigrata* Nyl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. v. p. 151 (1866).

Perhaps merely an alpine condition, with nearly obliterated thallus (very sparingly present in the British specimen) and slightly different spores.

Hab. Incrusting mosses on rocks in an alpine situation.—*B. M.* Summit of Ben Lawers, Perthshire.

22. **B. melæna** Arnold in Flora xlviii. p. 596 (1865).—Thallus effuse, very thin, leprose-granulose, sordid-greenish,

greyish or brownish-black (K−, CaCl−), often evanescent. Apothecia small, convex, immarginate, black; paraphyses concrete, violet- or bluish-black at the apices; hypothecium thick, brownish-red or purplish-black; spores linear-oblong, 3-septate, 0,014–22 mm. long, 0,004–6 mm. thick; hymenial gelatine bluish then dark-violet with iodine.—*B. milliaria* var. δ *melæna* Mudd Man. p. 188 (1861). *Lecidea melæna* Nyl. in Bot. Not. 1853, p. 182; Carroll in Journ. Bot. v. p. 256 (1867); Cromb. Lich. Brit. p. 71; Leight. Lich. Fl. p. 329; ed. 3, p. 353.

Exsicc. Mudd n. 159; Johns. n. 376.

Readily distinguished by the very dark thallus and apothecia.

Hab. On turfy ground, occasionally on dead wood, in upland districts.—*Distr.* Apparently very local in England, Wales and Ireland; common on the Grampians, Scotland; not seen from the Channel Islands.—*B. M.* Near Lyndhurst, New Forest, Hants; Dartmoor, Devon; Cader Idris, Merioneth; Ingleby Moor, Cleveland, Yorkshire; Eskdale, Cumberland; Achosragan Hill, Appin, Argyll; Ben Lawers, Rannoch, and at base of Ben-y-Gloe, Perthshire; Upper Glen Dee, Braemar, Aberdeenshire; Howth, Dublin; Croghan, Killarney, Kerry.

23. **B. leucoblephara** Arnold in Flora lxvii. p. 574 (1884).—Thallus determinate or subeffuse, thin, opaque, greyish- or greyish-green (K + yellow, CaCl−). Apothecia small, plane, margined, brownish-black or black, blackish within, the margin white; paraphyses concrete; hypothecium brownish-black; spores fusiform-oblong, 3-septate, colourless, 0,010–19 mm. long, 0,004–6 mm. thick; hymenial gelatine bluish then violet-coloured with iodine.—*Lecidea leucoblephara* Nyl. in Ann. Sci. Nat. ser. 4, xix. p. 338 (1863); Leight. Lich. Fl. ed. 3, p. 351; Cromb. in Grevillea xxii. p. 57.

Exsicc. Larb. Lich. Hb. without number.

Easily recognized by the white pubescent margins of the apothecia.

Hab. On rocks (found on the Continent on furze, heather, etc.).—*B. M.* Near Kylemore, Connemara, Galway.

24. **B. rhexoblephara** A. L. Sm.—Thallus effuse, thin, greyish or dirty-white (K−, CaCl−), often little visible. Apothecia rather small, black, urceolate, then plane, with a thickish prominent deeply-crenate margin; hypothecium thick, black, dark-brown in thin section; hymenium whitish; paraphyses brown, somewhat thick and septate at the apices; spores oblong- or fusiform-ellipsoid, 3-septate, 0,017–21 mm. long, 0,006–7 mm. thick; hymenial gelatine pale-bluish with iodine.—*Lecidea rhexoblephara* Nyl. in Mém. Soc. Cherb. v. p. 337 (1857) & in Öfvers. K. Vet. Akad. Förh. 1860, p. 297; Carroll in Journ. Bot. iii. p. 290 (1865); Cromb. Lich. Brit. p. 89; Leight. Lich. Fl. p. 333; ed. 3, p. 355.

Distinguished by the peculiar coronate margin of the apothecia on account of which it was separated by Th. Fries as a new genus,

Rhexophiale (Lich. Arct. p. 205 (1860)). Our specimens are sparingly fertile; the apothecia are somewhat scattered or occasionally approximate.

Hab. On decaying mosses among schistose rocks in an alpine locality.—*B. M.* Summit of Ben Lawers, Perthshire.

25. **B. premneoides** A. L. Sm.—Thallus effuse, thinly leprose, pale- or greyish-greenish (K−, CaCl−). Apothecia moderate, plane, margined, black; paraphyses slender; epithecium at times slightly greenish-suffused; hypothecium black; spores oblong, obsoletely or thinly 3-septate, 0,019–25 mm. long, 0,007–8 mm. thick; hymenial gelatine wine-red with iodine.—*Lecidea premneoides* Nyl. in Flora xlviii. p. 147 (1865); Leight. in Ann. Mag. Nat. Hist. ser. 3, xvii. p. 62 (1866) & Lich. Fl. p. 333; ed. 3, p. 350; Cromb. Lich. Brit. p. 79. Specimen not seen.

Hab. On walls.—*Distr.* Very rare in the Channel Islands (Jersey).

26. **B. leucophæopsis** A. L. Sm.—Thallus indeterminate, squamulose, whitish, the squamules small, roundish, irregular, adnate and depressed in the centre, scattered or contiguous (K + yellow, CaCl−). Apothecia moderate or somewhat large, sessile, plane or subconvex, brownish-black, opaque, concolorous within (dark-grey in the hymenial layer); hypothecium and epithecium yellow- or dark-brown; paraphyses very slender, loosely coherent; spores fusiform, 3–5-septate, 0,024–34 mm. long, 0,005–8 mm. thick; hymenial gelatine bluish, the asci at length wine-reddish, with iodine.—*Lecidea leucophæopsis* Nyl. in Flora lvi. p. 20 (1873); Cromb. in Grevillea i. p. 141; Leight. Lich. Fl. ed. 3, p. 364.

Crombie states that the thallus of this species is not uncommon on Ben Lawers, but it is very rarely seen in fruit. It is usually associated with *Sirosiphon saxicola*.

Hab. On quartzose stones.—*B. M.* On a wall, Ben Lawers (the only locality).

27. **B. violacea** Th. Fr. Lich. Scand. p. 372 (1874).—Thallus very thin, subgranulose, greyish-white (K−, CaCl−), often subevanescent. Apothecia small, adnate, nearly plane or subconvex, immarginate, pale-leaden-coloured; hypothecium colourless; paraphyses slender, concrete; spores oblong, 3-septate, often slightly curved, 0,014–17 mm. long, 0,005–7 mm. thick; hymenial gelatine bluish, the asci at length faintly wine-red, with iodine.—*Lecidea violacea* Crouan ex Nyl. in Flora xlv. p. 464 (1862); Carroll in Journ. Bot. iii. p. 290 (1865); Cromb. Lich. Brit. p. 71; Leight. Lich. Fl. p. 335; ed. 3, p. 355. Specimen not seen.

Resembles externally a biatorine form of *Lecanora syringea*.

Hab. On rocks in a maritime district.—*Distr.* Very local and sparingly in N. Scotland (Lerwick, Shetland Islands).

28. **B. trachona** Arnold in Flora lxvii. p. 575 (1884).—Thallus effuse, thin, subleprose, minutely granulose or nearly evanescent, whitish, greyish-white or greenish (K−, CaCl−). Apothecia minute, plane, opaque, thinly margined, dark-brown, at length convex and immarginate; hypothecium brownish or somewhat pale; paraphyses scanty, slightly incrassate at the apices, not well discrete; epithecium nearly colourless or slightly brownish-black; spores fusiform-oblong or fusiform, 1–3-septate, 0,011–19 mm. long, 0,0030–35 mm. thick; hymenial gelatine bluish then sordid-violet or wine-red with iodine.—*Verrucaria trachona* Ach. Meth. Suppl. p. 16 (1803). *Lecidea trachona* Nyl. in Flora xlvii. p. 620 (1864); Cromb. Lich. Brit. p. 71; Leight. Lich. Fl. p. 329; ed. 3, p. 351.

Exsicc. Larb. Cæsar. n. 80.

In our specimens the thallus is sordid-greenish. Apothecia and spermogones are frequent; when the latter only are present the plant resembles superficially a *Verrucaria*.

Hab. On granite rocks in maritime localities.—*Distr.* Rare in the Channel Islands and S.W. England.—*B. M.* The Warren, Noirmont, Jersey; Dixcart Bay, Sark; near Penzance, Cornwall.

29. **B. chlorococca** Græwe ex Stenh. in Öfvers. K. Vet. Akad. Förh. 1862, p. 473.—Thallus thin, furfuraceous or granulose, dull-yellowish-green. Apothecia reddish-brown or black, minute, adnate, convex, immarginate; hypothecium colourless; paraphyses gelatinous, distinct, dull-olive-green or pale; spores fusiform, straight or curved, 3–7-septate, 0,022–38 mm. long, 0,003–5 mm. thick; hymenial gelatine blue then dull-wine-red with iodine.

Var. **hilarior** Th. Fr. & Hult. Lich. Scand. p. 380 (1874).—Apothecia reddish or reddish-brown; paraphyses pale at the tips, otherwise as in the type, which has not been found in Britain.

Exsicc. Larb. Lich. Hb. n. 351.

Hab. On trees.—*B. M.* Charnwood Forest, Leicestershire.

30. **B. subturgidula** A. L. Sm.—Thallus effuse, very thin, greenish-white or obsolete. Apothecia small, scattered, convex, immarginate, dark-brown or pale-leaden-coloured; hypothecium brown, whitish in upper layer; paraphyses concrete; epithecium white or yellowish-white; spores oblong, 0,008–14 mm. long, 0,003–4 mm. thick; hymenial gelatine bluish then often tawny-yellow with iodine.—*Lecidea subturgidula* Nyl. in Flora li. p. 343 (1868); Cromb. in Journ. Bot. vii. p. 48 (1869) & Lich. Brit. p. 72; Leight. Lich. Fl. p. 324; ed. 3, p. 344.

According to Nylander allied to *L. apochrœella*, a Finland species, but differs in the larger spores and the colour of the hypothecium.

Hab. On old stumps of holly.—*B. M.* Near Lyndhurst, New Forest, Hants.

31. **B. deducta** A. L. Sm.—Thallus effuse, very thin, leprose, dispersed, greenish (K−, CaCl−), scarcely visible. Apothecia

subminute, blackish, somewhat plane and thinly margined, then convex and immarginate, reddish in thin section; hypothecium darker in the middle; paraphyses not discrete; spores ellipsoid or oblong, 3-septate, colourless, brownish in the mass, 0,010–13 mm. long, 0,0035–45 mm. thick; hymenial gelatine bluish then wine-reddish with iodine.—*Lecidea deducta* Nyl. in Flora lii. p. 410 (1869); Cromb. in Journ. Bot. vii. p. 233 (1869) & Lich. Brit. p. 72; Leight. Lich. Fl. p. 328; ed. 3, p. 349.

Distinguished from the preceding, to which it is closely related, chiefly by the colour of the apothecia, but also by that of the hypothecium and epithecium. The proper thallus, almost always obscured by a foreign gelatinous thallus, is only very sparingly present in the specimens gathered.

Hab. On old stumps of holly.—*B. M.* Near Brockenhurst, New Forest, Hants.

75. **BACIDIA** De Not. in Giorn. Bot. Ital. ii. p. 189 (1846) emend.; Th. Fries Lich. Arct. p. 179 (1860). *Scoliciosporum* Massal. Ric. Lich. p. 104 (1852); Mudd Man. p. 185. *Raphiospora* Massal. Alc. Gen. Lich. p. 11 (1853); Mudd Man. p. 186. (Pl. 12.)

Thallus effuse, minutely squamulose or variously crustaceous. Algal cells *Protococcus*. Apothecia brightly coloured or dark, sometimes carbonaceous (*Raphiospora*), immarginate or with proper margin only; asci usually 8-spored; spores elongate, acicular, colourless, pluri-septate, usually straight or sometimes spirally-curved (*Scoliciosporum*).

The genus *Bacidia*, as here understood, includes not only those forms of *Lecideaceæ* with acicular straight spores, but also *Scoliciosporum* in which the spores are spirally curved, and *Raphiospora* which has been considered by some authors distinct on account of the carbonaceous outer wall of the apothecium.

1. **B. pulvinata** Mudd Man. p. 185 (1861).—Thallus indeterminate, thickish, pulvinate, granulose-squamulose, the squamules minute, congregate in subconvex tufts, pale-greenish-brown or cream-coloured (K−, CaCl−); hypothallus thickish, black. Apothecia small, at first concave, then plane with thick obtuse margin, at length convex and immarginate, black, concolorous within; paraphyses slender, conglutinate; epithecium deep-yellow; hypothecium thick, dark-reddish-brown (K+blackish); spores acicular or slightly clavate, straight or somewhat curved, 3–7-septate, 0,020–38 mm. long, 0,003–5 mm. thick; hymenial gelatine, especially the asci, bluish then wine-red with iodine.—*Lecidea pulvinata* Tayl. in Mackay Fl. Hib. ii. p. 123 (1836); Cromb. Lich. Brit. p. 75; Leight. Lich. Fl. p. 345; ed. 3, p. 372.

Characterized by the peculiar thallus which grows in small scattered tumid roundish or difform pulvinate masses. The apothecia are not numerous in the specimens seen, some of the tufts being entirely barren.

Hab. Overspreading decayed mosses on turfy soil in mountainous districts.—*Distr.* Rare in Wales, S.W. and N.W. Ireland.—*B. M.* Barmouth, Merioneth; Glyder, Carnarvonshire; near Dunkerron and Mangerton, Kerry; Barnageeha and Doughruagh Mt., Galway.

Form **thiopsora** A. L. Sm.—Thallus white-sulphureous. Apothecia often 2–4-connate, subconvex, naked or greyish-yellow-suffused; otherwise as in the type.—*Lecidea thiopsora* Nyl. in Flora lix. p. 573 (1876); Cromb. in Grevillea v. p. 106; Leight. Lich. Fl. ed. 3, p. 354. *L. pulvinata* f. *thiopsora* Nyl. in Flora lxii. p. 223 (1879); Cromb. in Grevillea viii. p. 30.

Exsicc. Larb. Lich. Hb. n. 185.

Hab. On mossy ground among rocks in a mountainous region.—*B. M.* Doughruagh Mt., Connemara, Galway (the only locality).

2. **B. polysita** A. L. Sm.—Thallus dark-grey or pale-greyish-brown, thickish, squamulose, the squamules crenulate or sometimes slightly concave (K−, CaCl−). Apothecia brown or brownish-black, sessile, somewhat plane, immarginate, at length convex and prominent; hypothecium thick, reddish-yellow, brown or blackish-brown in a thick section; paraphyses distinct, colourless at the apices and not clavate; spores acicular or slenderly clavate, straight, 3–11-septate; hypothecium and lower portion of the hymenium K+purple.—*Lecidea polysita* Stirton in Scott. Nat. iv. p. 28 (1874); Leight. Lich. Fl. ed. 3, p. 368. Specimen not seen.

Hab. On old dead bark.—*Dist.* Rare in W. Scotland (Ben Brecht, Argyll).

3. **B. rosella** De Not. in Giorn. Bot. Ital. ii. p. 189 (1846).—Thallus effuse, thin, unequal or subgranulose, greyish-green or greyish-white. Apothecia moderate, sessile, concave, then plane with thick obtuse paler margin, at length convex, immarginate, rose- or flesh-coloured, slightly pruinose, whitish within; hypothecium colourless; paraphyses slender, loosely coherent; epithecium granulose, yellowish; spores acicular, colourless, 0,068–98 mm. long, 0,0045–50 mm. thick; hymenial gelatine deep blue then sordid-violet with iodine.—Mudd Man. p. 181. *Lichen rosellus* Pers. in Ust. Ann. vii. p. 25 (1794) (non Engl. Bot. t. 1651, *vide* Part i. p. 419). *Lecidea rosella* Ach. Meth. p. 57 (1803); S. F. Gray Nat. Arr. i. p. 474; Cromb. Lich. Brit. p. 73; Leight. Lich. Fl. p. 341 pro parte; ed. 3, p. 369 pro parte. *L. alabastrina* Ach. Lich. Univ. p. 190 (1810); Hook. Fl. Scot. ii. p. 40 & in Sm. Eng. Fl. v. p. 184; S. F. Gray *l. c.*

Easily recognized by the colour of the apothecia, which however at times become rather darker in age; though numerous they are somewhat scattered, especially when the thallus is less crowdedly granulose. In other respects it is intimately related to the following species.

Hab. On the trunks of trees in maritime and upland districts.—*Distr.* Very local and scarce in S., W., and N. England (Ripon,

Yorkshire, *fide* Mudd).—*B. M.* Chelsfield, Kent; near Hastings, Sussex; near Ringwood, Hants; Oldbury and near Alfrick, Worcestershire.

4. **B. luteola** Mudd Man. p. 183, t. 3, f. 68 (1861) pro parte.—Thallus effuse, thin, leprose-granulose, greyish or greyish-green (Kf + yellowish, CaCl−), at times nearly obsolete. Apothecia moderate, sessile, naked, at first concave, becoming plane and obtusely margined, at length convex or subglobose, the margin excluded, yellow-reddish or reddish-flesh-coloured; hypothecium pale-yellowish; paraphyses slender, loosely coherent; epithecium not distinct; spores acicular, pluri-septate (the septa at length 16), 0,045–90 mm. long, 0,003–45 mm. thick; hymenial gelatine bluish then dark-wine-red or violet with iodine.—*B. rubella* Massal. Ric. Lich. p. 118 (1852); Mudd Man. p. 182, t. 3, f. 68. *Lichen lutereus* Gmelin Syst. Nat. ii. p. 1359 (1791)? *L. luteolus* Schrad. Spicil. Fl. Germ. p. 85 (1794). *L. vernalis* With. Arr. ed. 3, iv. p. 14 (1796) (non L., non Hoffm.); Engl. Bot. t. 845. *Verrucaria rubella* Hoffm. Deutschl. Fl. ii. p. 174 (1795). *Lecidea luteola* Ach. Meth. p. 60 (1803) (excl. vars.); S. F. Gray Nat. Arr. i. p. 472; Tayl. in Mackay Fl. Hib. ii. p. 126; Cromb. Lich. Brit. p. 73. *L. vernalis* Ach. Meth. p. 68 (1803); S. F. Gray *l. c.* p. 470; Hook. in Sm. Eng. Fl. v. p. 183 pro parte. *L. rubella* Schær. Spicil. p. 168 (1836); Leight. Lich. Fl. p. 341; ed. 3, p. 369 (excl. syn. *Lichen porriginosus*); Cromb. in Grevillea xxii. p. 58.

Exsicc. Bohl. n. 91; Leight. n. 92; Cromb. n. 86; Larb. Lich. Hb. n. 184.

Lichen lutereus Gmelin is quoted by Acharius (Prod. Lich. Suec. p. 42 (1798)) as a synonym, but this identification is uncertain. The species-name *vernalis*, based on *Lichen vernalis* Lightf. (Fl. Scot. ii. p. 805 (1777)) has been adopted by some authors; but Lightfoot's plant is identical, in part at least, with *Lecanora ferruginea* (Pt. i. p. 376). *Lichen rubellus* Ehrh. does not rank, being only a herbarium name. The apothecia are usually abundant and scattered, but sometimes there are several aggregate with the margin irregular and sublobate.

Hab. On trunks of trees, chiefly elms, in wooded maritime and upland situations.—*Distr.* General and common in most parts of England, rare in Wales, Scotland, Ireland, and the Channel Islands. —*B. M.* Patrimoine, Jersey; Guernsey; Ulting, Broomfield, Gosfield Hall, Quendon and Epping Forest, Essex; Chilstone Park, Kent; Middleton, Lavington Park, Chanctonbury and Glynde, Sussex; Lyndhurst, New Forest, Hants; Ilsham, Torquay, Devon; Kynance, Coverack, near the Lizard, St. Judy and near Penzance, Cornwall; Bathampton Downs, Somerset; near Bourton-on-Water, Cirencester, Clifton and Chesterton, Gloucestershire; near Cambridge; near Yarmouth, Norfolk; Gopsall, Leicestershire; Broadwas and near North Malvern, Worcestershire; Aberdovey, Merioneth; Oswestry and Skelton Rough, near Shrewsbury, Shropshire; Kildale and Newton Wood, Cleveland, Yorkshire; Teesdale, Durham; Airds, Appin, Argyll; Craiglockart, near Edinburgh; Aberfeldy, Perthshire;

Tervoe and Carrigogunnel, near Limerick; Shane's Castle, Antrim; Connemara, Galway.

Var. **porriginosa** A. L. Sm. — Thallus as in the type. Apothecia reddish-flesh-coloured, the margin white-suffused, at length convex and immarginate; spores 3–7-septate, 0,048–62 mm. long, 0,003–35 mm. thick.—*Lichen porriginosus* Turn. in Trans. Linn. Soc. viii. p. 94, t. 8, f. 4 (1807). *Lecidea luteola* var. *porriginosa* Cromb. Lich. Brit. p. 73 (1870). *L. rubella* var. *porriginosa* Cromb. in Grevillea xxii. p. 58 (1893).

Distinguished by the white marginal pruina, ultimately evanescent, which gives the apothecia much the aspect of those of *B. rosella*.

Hab. On trunks of trees, chiefly elms, in maritime and upland tracts.—*Distr.* Seen from only a few localities in E. and S. England and S. Wales.—*B. M.* Near the Lizard, Cornwall; near Beeding Windmill and Hurstpierpoint, Sussex; Brockenhurst, Hants; Llandrindod, Radnorshire; Yarmouth, Norfolk.

5. **B. acerina** Arnold in Flora xlv. p. 391 (1862).—Thallus thinnish, coarsely granular, yellowish- or greenish-white. Apothecia prominent, at first concave with a thick rounded margin, becoming plane or sometimes subconvex, flesh-red, then chestnut-brown to blackish; hypothecium colourless; paraphyses slender, coherent, more or less violet-blue or violet-red at the apices according to the colour of the apothecium; epithecium colourless or rose-coloured; spores acute at each end, straight or spirally curved, up to 15-septate, 0,050–80 mm. long, 0,0025–35 mm. thick.—*Lecidea luteola* var. *acerina* Ach. Meth. p. 60 (1803). *L. acerina* Nyl. in Flora lv. p. 356 (1872); Cromb. in Grevillea xxii. p. 58.

Included by Crombie in his list of British Lichens. There is no British specimen in the Museum, and I know of no record.

Hab. On bark chiefly of pine, more rarely of oak.

6. **B. phacodes** Koerb. Parerg. Lich. p. 130 (1860).—Thallus effuse, thin, leprose-granulose, greenish or whitish. Apothecia small, sessile, whitish or pale-reddish, at first almost plane with paler margin, then convex, immarginate; paraphyses concrete, colourless, pale-yellowish at the apices; hypothecium colourless; spores very thinly acicular, faintly 3–15-septate, 0,027–0,040 mm. long, 0·002 mm. thick; hymenial gelatine bluish then wine-red with iodine.—*B. albescens* Zwackh in Flora xlv. p. 495 (1862). *Lecidea luteola* var. δ *chlorotica* Ach. Lich. Univ. p. 196 (1810). *L. arceutina* f. *chlorotica* Cromb. Lich. Brit. p. 73 (1870). *L. phacodes* Leight. Lich. Fl. p. 343 (1871); ed. 3, p. 363. *L. chlorotica* Nyl. ex Norrl. in Medd. Sällsk. Faun. & Fl. Fenn. i. p. 31 (1876); Cromb. in Grevillea vi. p. 21; f. *albescens* Hepp ex Leight. Lich. Fl. ed. 3, p. 546 (1879).

Exsicc. Larb. Lich. Hb. nos. 108, 183; Cromb. n. 173.

Hab. On trunks of trees, chiefly ash and maple, in maritime and upland wooded situations.—*Distr.* Not uncommon in England and S. and W. Ireland, rare in S. Wales and the Channel Islands, not recorded from Scotland.—*B. M.* St. Ann Port, Jersey; Newlyn Cliff, Penzance, Cornwall; Shanklin, I. of Wight; near Bovey Tracey, Devon; New Forest, Hants; Glynde, Sussex; Maidstone, Kent; Ulting and Gosfield Hall, Essex; Wimpole Park and near Newmarket, Cambridgeshire; near Brandon, Suffolk; near Worcester; Fort Hill, Fishguard, Pembrokeshire; near Yarm, Cleveland, Yorkshire; Leven's Park, Westmoreland; Dunscombe's Wood, Cork; Tervoe and Castleconnel, Limerick; Dinish, Killarney, Kerry; Lough Feagh, Connemara, Galway.

7. **B. fuscorubella** Arnold in Flora liv. p. 55 (1871).—Thallus effuse, thin, dark-grey or whitish. Apothecia brown, sessile or adnate, large, at first plane and thinly margined, then convex and immarginate; hypothecium brownish-yellow; paraphyses slender, loosely coherent, yellowish at the apices; spores straight, rather stout, attenuate towards the base, 4–16-septate, 0,060–75 mm. long, 0,003–5 mm. thick; hymenial gelatine deep-purple-violet with iodine.—*Verrucaria fuscorubella* Hoffm. Deutschl. Fl. ii. p. 175 (1795). *Lecidea fuscorubella* Cromb. in Grevillea xxii. p. 58 (1893).

Hab. On the bark of trees.—*Dist.* Rare in S. and Central England. —*B. M.* Near Stoney Cross, New Forest, Hants; Malvern, Worcestershire.

8. **B. herbarum** Arnold in Flora xlviii. p. 596 (1865).—Thallus effuse, very thin, granulose, greyish-white (K−, CaCl−), often obsolete. Apothecia moderate in size, sessile, at first prominent and almost closed with a shining margin, at length convex and immarginate, reddish or dark-red; hypothecium brownish- or reddish-yellow; paraphyses coherent, slightly clavate at the apices; epithecium colourless; spores acicular, straight or somewhat flexuose, narrower at the apices, 3–5- or usually 5–7-septate, 0,038–56 mm. long, 0,001–2 mm. thick; hymenial gelatine blue then sordid-wine-red with iodine.—*Secoliga herbarum* Stiz. in Acad. Cæs. Leop. Nov. Act. xxx. 3, p. 46 (1863). *Lecidea herbarum* Cromb. in Journ. Bot. xii. p. 148 (1874); Leight. Lich. Fl. ed. 3, p. 372.

Exsicc. Larb. Lich. Hb. n. 350.

Stizenberger considered this plant to be intermediate between *B. effusa* or *B. fuscorubella* and *B. muscorum*, agreeing with the latter in habitat and colour of the older apothecia, but approaching more nearly to *B. effusa* in the form and size of the spores. The thallus varies from being very granular and contiguous to dispersed, scanty, or obsolete.

Hab. Incrusting decaying mosses on granitic rocks in maritime tracts.—*Distr.* Local and scarce in the Channel Islands.—*B. M.* Near Rozel, Jersey; Port Gorey and the Eperquerie, Sark.

9. **B. effusa** Arnold in Flora xli. p. 505 (1858).—Thallus effuse, thin, crustaceous, scurfy, yellowish-green or whitish, sometimes scarcely visible. Apothecia rather small, scattered or sometimes several aggregate, at first plane with a thickish margin, then convex and immarginate, pale-yellowish-flesh-coloured, sometimes becoming reddish or brownish; hypothecium colourless; paraphyses slender, subdiscrete, colourless, the epithecium sometimes thinly brownish; spores narrowly clavate, straight or slightly curved, pluri-septate, usually about 0,045 mm. long, 0,001–2 mm. thick, sometimes shorter or sometimes longer; hymenial gelatine and asci blue with iodine.—*Lichen effusus* Sm. Engl. Bot. t. 1863, two upper figures (1808). *Biatora effusa* var. *β intermedia* Hepp ex Stiz. in Acad. Cæs. Leop. Nov. Act. xxx. 3, p. 42, t. 2, f. 17 (1863). *Lecidea effusa* Leight. Lich. Fl. p. 343 (1871) (excl. vars.); ed. 3, p. 370 (excl. vars.); Cromb. in Grevillea xxii. p. 58 (incl. var. *intermedia*, excl. vars. *arceutina* and *hypnæa*). *L. intermedia* Leight. Lich. Fl. ed. 3, p. 368 (1879).

Exsicc. Larb. Lich. Hb. n. 233; Lich. Cæsar. n. 74.

Resembles *B. arceutina* in the character of the thallus and the long, narrow spores, but differs in the constantly lighter coloured apothecia, which in some specimens become brownish.

Hab. On trees.—*Distr.* Rare in the Channel Islands, England, Wales and Ireland; not recorded from Scotland.—*B. M.* New Forest, Hants; Stowell Park, Gloucestershire; Penmaenmawr, Carnarvonshire; Cliffrigg, Cleveland, Yorkshire; Westport, Mayo; Lough Feagh, Connemara, Galway.

Form **hemipolia** A. L. Sm.—Thallus thin, whitish-grey, smooth. Apothecia convex, semiglobose, partly pale-brownish, partly livid; epithecium yellowish; otherwise as in the species. —*Lecidea arceutina* f. *hemipolia* Nyl. in Flora lii. p. 413 (1869) nomen.

Characterized by the colour of the epithecium and of the constantly convex apothecia.

Hab. On the bark of trees in maritime districts in S. England.—*B. M.* St. Lawrence, I. of Wight; near Lymington, Hants.

10. **B. prasinoides** Oliv. Exp. Syst. Lich. ii. p. 26 (1900).—Thallus effuse, thin or very thin, subgranulate-leprose, greenish. Apothecia minute, somewhat plane, obtusely or obsoletely margined, pale-flesh-colour, within colourless; paraphyses slender, colourless at the apices; hypothecium colourless; spores rod-shaped or subfusiform, 1–3-septate, 0,012–21 mm. long, 0,0025–35 mm. thick; hymenial gelatine and asci wine-red with iodine.—*Lecidea prasinoides* Nyl. in Flora xlviii. p. 146 (1865); Carroll in Journ. Bot. vi. p. 100 (1868); Cromb. Lich. Brit. p. 74; Leight. Lich. Fl. p. 326; ed. 3, p. 345.

Hab. On rocks.—*B. M.* Dinish, Killarney, Kerry.

11. **B. carneoglauca** A. L. Sm.—Thallus determinate, thin, subleprose, glaucous-green (K−, CaCl−), limited at the circumference by a white hypothallus. Apothecia minute, convex, immarginate, pale- or dull-flesh-coloured; hypothecium and epithecium colourless; paraphyses not well discrete; spores narrowly fusiform, 1–5-septate, 0,025–40 mm. long, 0,0030–35 mm. thick; hymenial gelatine bluish then tawny-yellow with iodine.—*Lecidea carneoglauca* Nyl. in Flora lvi. p. 295 (1873); Cromb. in Grevillea ii. p. 90; Leight. Lich. Fl. ed. 3, p. 366.

Exsicc. Larb. Lich. Hb. without number.

In our specimens the spermogones alone are present; they are minute, urceolate and flesh-coloured with a pale margin; spermatia oblong, 0,004–5 mm. long, 0,0015 mm. thick.

Hab. On siliceous rocks.—*B. M.* Rozel, Jersey (the only locality).

12. **B. chloroticula** A. L. Sm.—Thallus effuse, very thin, subleprose, greenish (K−, CaCl−). Apothecia very minute, plane, margined, whitish-flesh-coloured, the margin whitish; hypothecium colourless; paraphyses not well discrete; spores thin, acicular, straight or slightly bent, 0,0020–35 mm. long, 00,01 mm. thick; hymenial gelatine wine-reddish with iodine.—*Lecidea chloroticula* Nyl. in Flora lx. p. 564 (1877); Cromb. in Grevillea vi. p. 112; Leight. Lich. Fl. ed. 3, p. 254.

Exsicc. Larb. Lich. Hb. n. 138.

Closely allied to *B. inundata*, differing in the very minute pale-coloured peziza-like apothecia. In our specimen the greenish thallus spreads over the stone, and the apothecia are crowded in one small group. The spores are faintly but quite distinctly pluri-septate, and the slender arcuate spermatia measure up to 0,050 mm. long, 0,0008 mm. thick.

Hab. On mica-schist rocks in a stream in an upland situation.—*B. M.* Mweelan, Connemara, Galway (the only locality).

13. **B. carneoalbens** A. L. Sm.—Thallus greenish-glaucous, thin, effuse, granulose (K+yellow, CaCl+red). Apothecia pale-flesh-coloured, sometimes becoming partly dark-coloured, convex, immarginate; hypothecium colourless; paraphyses concrete, colourless at the apices; spores elongate-fusiform, 3–7-septate, 0,023–27 mm. long, 0,0025–35 mm. thick; hymenial gelatine tawny-wine-red with iodine, especially the asci which are at first blue at the tips.—*Lecidea carneoalbens* Nyl. in Flora lix. p. 307 (1876); Cromb. in Grevillea v. p. 26; Leight. Lich. Fl. ed. 3, p. 366

Near to *B. inundata*, but differs in the lighter-coloured apothecia and in the form of the spores, which are straight and slightly narrower at one end. The paraphyses are yellow in the mass.

Hab. On water-washed rocks in a maritime district.—*B. M.* Killery Bay, Connemara, Galway (the only locality).

14. **B. scopulicola** A. L. Sm.—Thallus effuse, granular-verrucose, unequal, greyish- or brownish-green. Apothecia small, at first plane and obtusely margined, then convex and immarginate, brownish-flesh-coloured; paraphyses slender; epithecium colourless; hypothecium colourless (the subhymenial layer tawny-brownish); spores acicular, thinly or obsoletely 3–5-septate, 0,032–44 mm. long, 0,002 mm. thick; hymenial gelatine bluish then tawny-wine-red with iodine.—*Lecidea scopulicola* Nyl. in Flora lvii. p. 312 (1874); Cromb. in Grevillea iii. p. 23; Leight. Lich. Fl. ed. 3, p. 368.

Distinguished from the preceding species by the more developed thallus and longer spores.

Hab. On maritime rocks in S. England.—*B. M.* Rosemodris Cliff, Penzance, Cornwall (the only locality).

15. **B. inundata** Koerb. Syst. Lich. Germ. p. 187 (1855).—Thallus effuse, granulose or rimose-areolate, greenish (K−, CaCl−). Apothecia minute, subinnate-sessile, at first concave and thinly margined, at length convex and immarginate, pale-brown, leaden-coloured, dark-red or blackish; paraphyses coherent, colourless at the apices; hypothecium pale; spores straight or curved, elongate, attenuate at the apices, 3–7-septate, 0,034–40 mm. long, 0,0015–25 mm. thick; hymenial gelatine bluish then wine-red or violet with iodine.—*B. luteola* var. γ *inundata* Mudd Man. p. 183 (1861). *Biatora inundata* Fr. in Vet. Acad. Handl. 1822, p. 270. *Lecidea inundata* Nyl. in Flora lviii. p. 106 (1875); Cromb. in Grevillea xxii. p. 58. *L. arceutina* Nyl. f. *inundata* Cromb. Lich. Brit. p. 73 (1870). *L. effusa* var. *inundata* Leight. Lich. Fl. p. 344 (1871); ed. 3, p. 371.

Exsicc. Mudd n. 149.

The thallus, occasionally little developed, varies somewhat in thickness, and when dry is often tawny-greenish. It is usually well fertile; the apothecia are very variable in colour in different specimens; the spores are often curved to an S-shape. The spermogones are frequent with curved spermatia, 0,0025–30 mm. long, 0,0006 mm. thick.

Hab. On rocks and boulders, at times inundated, in maritime and upland tracts, occasionally on moist wood.—*Distr.* Seen only from a few localities in Great Britain and Ireland; no doubt often overlooked.—*B. M.* Malpas, near Truro, and Mt. Edgecumbe, Cornwall; Fishguard Harbour, Pembrokeshire; near Ayton and Airyholme Wood, Cleveland, Yorkshire; Teesdale, Durham; near Ballachulish, Argyll; Glen Lochay, Killin, Perthshire; Glen Callater, Braemar, Aberdeenshire; Lettermore, Connemara, Galway.

Subsp. **allecta** A. L. Sm.—Apothecia white-flesh-coloured; spores acicular, thin, 0,056–70 mm. long, 0,001 mm. thick; otherwise as in the type.—*Lecidea inundata* subsp. *allecta* Nyl. in Flora lx. p. 567 (1877); Cromb. in Journ. Bot. xx. p. 275 (1882) & in Grevillea xxii. p. 58. Specimen not seen.

Characterized by the colour of the apothecia and the thinner longer acicular spores. Spermatia as in the species.

Hab. On siliceous rocks in a maritime district.—*Distr.* Extremely local and scarce in W. Ireland (near Kylemore, Galway).

16. **B. caligans** A. L. Sm.—Thallus indeterminate, thinnish, rugose, diffract, fuliginous-black (K+, CaCl). Apothecia small, plane, obtusely margined, blackish, pale within; hypothecium colourless (the perithecium somewhat brownish above); paraphyses concrete, colourless at the apices; spores thinly acicular, indistinctly septate, 0,030–35 mm. long, 0,0015 mm. thick; hymenial gelatine wine-reddish with iodine.—*Lecidea caligans* Nyl. in Flora lvii. p. 10 (1874); Cromb. in Grevillea ii. p. 140 & xxii. p. 58; Leight. Lich. ed. 3, pp. 283, 371.

Resembling in some respects *B. inundata*, but very distinct in the dark colour of the thallus, and in the rather larger apothecia. The thallus is overrun by a thin *Scytonema*.

Hab. On rocks in a maritime district.—*B. M.* Island of Alderney (the only locality).

17. **B. egenula** Th. Fr. Lich. Scand. p. 363 (1874).—Thallus very thinly granulose, greyish (Kf + yellowish), nearly obsolete. Apothecia small, plane, obtusely margined, blackish or dark-brown, the margin thickish, at length evanescent, within pale-whitish (brownish in the centre); paraphyses coherent, clavate at the apices; epithecium colourless or faintly coloured; hypothecium yellow-brown or reddish in thin section; spores acicular, simple or indistinctly septate, 0,020–38 mm. long, 0,0015–20 mm. thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea egenula* Nyl. in Flora xlviii. p. 147 (1865). *L. Leightoniana* Larb. ex Leight. Lich. Fl. ed. 3, p. 368 (1879); Cromb. in Grevillea xxii. p. 59.

Exsicc. Larb. Lich. Hb. n. 144.

Allied to *B. arceutina*, but differs in the much smaller plane darker apothecia, the usually shorter spores, and the colour of the hypothecium. The apothecia are somewhat scattered.

Hab. On schistose rocks in an upland tract.—*B. M.* Doughruagh Mt. and Lough Feagh, Connemara, Galway.

18. **B. arceutina** Branth & Rostr. in Bot. Tidsskr. iii. p. 233 (1869).—Thallus effuse, very thin, smoothish or subgranulose-verrucose, whitish or greyish, often evanescent. Apothecia small, sessile, at first plane with darker margin, then convex, immarginate, dark-red or blackish and shining, colourless within; epithecium brown or brownish; hypothecium yellowish; spores narrowly acicular, straight or slightly curved, 3–15-septate, 0,044–54 mm. long, 0,0015–25 mm. thick: hymenial gelatine bluish then wine-red or sordid with iodine.—*Lecidea luteola* var. γ *arceutina* Ach. Meth. p. 61 (1803) & Lich. Univ. p. 197; var. *fuscella* Fr. Summa p. 112 (1846). *L. arceutina* Nyl. in Flora

li. p. 165 (1868); Cromb. Lich. Brit. p. 73 pro parte. *L. effusa* var. *fuscella* Leight. Lich. Fl. p. 344 (1871); ed. 3, p. 371.

Exsicc. Mudd n. 148; Leight. nos. 211, 279.

Hab. On smooth trunks of trees in upland districts, rarely on old palings.—*Distr.* Here and there sparingly in Great Britain, rare in S.W. Ireland.—*B. M.* Brading Woods, Isle of Wight; near Lyndhurst, New Forest, Hants; Ilsham, Torquay and Ullacombe, near Bovey Tracey, Devon; Hurstwood, Tunbridge Wells, Sussex; Rayleigh Wood, Maldon, Hadleigh Woods, Langford and Wellington, Essex; Bathampton Downs, Somersetshire; Northleach, Colesborne and Rodmarton, Gloucestershire; Warringdon, near Worcester; Dolgelly, Merioneth; Brilley, Radnorshire; Airyholme Wood, Cleveland, Yorkshire; High Force, Teesdale, Durham; Barcaldine, Argyll; near Killin, Ben Lawers and Falls of Moness, Aberfeldy, Perthshire; Abergeldie and Craig Cluny, Braemar, Aberdeenshire; Muckruss Demesne and Upper Lake, Killarney, Kerry.

Var. **hypnæa** A. L. Sm.—Thallus very thin, granulose-verrucose. Apothecia at length convex, brown or blackish; spores 0,045–70 mm. long; hymenial gelatine bluish with iodine.—*Lecidea arceutina* var. *hypnæa* Nyl. in Flora li. p. 165 (1868). *L. effusa* var. γ *arceutina* f. *hypnæa* Cromb. in Grevillea xxii. p. 58 (1893).

Exsicc. Larb. Lich. Cæsar. n. 83.

Hab. Incrusting mosses and hepatics on shady rocks in a maritime locality.—*B. M.* The Warren Noirmont, Jersey (the only locality).

19. **B. Beckhausii** Koerb. Parerg. Lich. p. 134 (1860).—Thallus effuse, thin, granular, unequal, whitish or greyish or evanescent (K−, CaCl−). Apothecia small, at first plane with a thickish margin, becoming convex and immarginate, black or somewhat paler when moist; hypothecium colourless or pale-brownish; paraphyses conglutinate, olive- or greenish-black towards the apices; spores rod-shaped, blunt at the ends, 2–7-septate, 0,016–32 mm. long, 0,002–3 mm. thick; hymenial gelatine pale-bluish then wine-red with iodine.—*Biatora stenospora* Hepp Flecht. Eur. n. 516 (1860). *Lecidea umbrina* subsp. *bacillifera* Nyl. Lich. Scand. p. 210 (1861). *L. bacillifera* Carroll in Journ. Bot. iii. p. 290 (1865); Cromb. Lich. Brit. p. 74 pro parte & in Grevillea xxii. p. 59; Leight. Lich. Fl. p. 342; ed. 3, p. 370 (excl. var. *alpina*). *L. stenospora* Nyl. in Flora lii. p. 413 (1869); Cromb. in Grevillea xxii. p. 59.

Exsicc. Larb. Lich. Hb. n. 516.

Distinguished by the somewhat narrow hymenium, with shorter asci and spores, and by the dark colour of the epithecium which penetrates downwards. A form with rather large apothecia scattered or aggregate in small groups was found by Crombie parasitic on the squamules of *Cladonia pyxidata* var. *pocillum*.

Hab. On bark of trees.—*Distr.* Somewhat rare throughout the British Isles.—*B. M.* Near Lyndhurst, Hants; Brandon Park, Suffolk; Dolgelly, Merioneth; Aberfeldy, Perthshire; Barcaldine, Argyll.

Var. **polisæna** Arnold in Flora liv. p. 53 (1871).—Thallus as in the species. Apothecia pallid, leaden-coloured or subolivaceous, usually whitish-pruinose.—*Bacidia luteola* var. δ *cæsiopruinosa* Mudd Man. p. 183 (1861) (excl. *hab.* on rocks). *Lecidea umbrina* subsp. *polisæna* Nyl. Lich. Scand. p. 210 (1861). *L. effusa* var. *cæsiopruinosa* Leight. Lich. Fl. p. 344 (1871); ed. 3, p. 271.

Exsicc. Leight. n. 150; Mudd n. 150.

Hab. On trees.—*Distr.* Rare in W., central and N. England.—*B. M.* Near Dursley, Gloucestershire; Broome, Shropshire; Pirton, near Worcester; Cleveland and Stagdale, Yorkshire.

20. **B. incompta** Anzi Cat. Lich. Sondr. p. 70 (1860).—Thallus effuse, thinnish, granulose-pulverulent, greyish-green (K−, CaCl−). Apothecia small, adnate or appressed, black or purplish-black, plane and thinly margined, the margin flexuose, at length somewhat convex, difform, and immarginate (K + reddish-violet); hypothecium thick, reddish-black; paraphyses coherent, sordid-reddish; spores shortly acicular, 1–7- usually 3-septate, 0,015–29 mm. long, 0,002–3 mm. thick; hymenial gelatine pale-bluish then wine-red with iodine.—Mudd Man. p. 184 (? excl. var. *atro-sanguinea*). *Lecidea incompta* Borr. in Engl. Bot. Suppl. t. 2699 (1831); Hook. in Sm. Engl. Fl. v. p. 180; Leight. Lich. Fl. p. 325; ed. 3, p. 345; Cromb. in Grevillea xxii. p. 59. *L. umbrina* subsp. *bacillifera* var. *incompta* Nyl. Lich. Scand. p. 210 (1861). *L. bacillifera* subsp. *incompta* Cromb. Lich. Brit. p. 74 (1870) (incl. f. *minor*).

Exsicc. Leight. n. 162; Mudd n. 151; Larb. Lich. Hb. n. 174.

The apothecia are numerous and sometimes several confluent; they are well characterized by the reddish colour internally. The thallus is usually well developed, closely covering the inequalities of the bark, but a state has been found growing on wood where it is reduced to a few granules. Form *minor* (*Secoliga atrosanguinea* var. *incompta* f. *minor* Stiz. in Acad. Cæs. Leop. Nova Acta xxx. 3, p. 20 (1863)) is distinguished by the finer granules of the thallus and the smaller apothecia.

Hab. On the trunks of old trees in maritime and upland wooded districts.—*Distr.* Uncommon in England, though plentiful where it occurs; rare in Scotland, Ireland, and the Channel Islands.—*B. M.* Near Rozel, Jersey; Penshurst, Kent; Albourne, Sussex; near Shanklin, I. of Wight; Lyndhurst, New Forest, Hants; near Exeter, near Newton Abbot and Ugbrook Park, Devon; near St. German's, Cornwall; Albourne, Glynde, Dawny and Wakehurst, Sussex; Gosfield Hall, Essex; Thorngate, near Cirencester, Gloucestershire; Oswestry, Shropshire; Wimpole Park, Cambridgeshire; Gopsall Park, Leicestershire; Hindlip and Kempsey, near Worcester; Nannau, Dolgelly, Merioneth; Barcaldine, Argyll; Adare, Limerick; Dinish, Killarney, Kerry.

21. **B. muscorum** Mudd Man. p. 184 (1861).—Thallus effuse, thin, granulose, greyish-white or whitish (K−, CaCl−). Apo-

thecia small, at first plane with thin entire margin, at length convex and immarginate, black; paraphyses incrassate at the apices; epithecium blackish; hypothecium dark-reddish; spores bacilliform, straight or slightly curved, 3–7-septate, 0,027–40 mm. long, 0,0025–30 mm. thick; hymenial gelatine pale-blue then wine-red with iodine.—*Lichen muscorum* Weber Spicil. Goett. p. 183 (1778)?; Swartz Meth. Musc. p. 36 (1781); Relhan Fl. Cantab. p. 424 with fig.; With. Arr. ed. 3, iv. p. 7 pro parte; Engl. Bot. t. 626 (*spermogoniiferous*). *Lecidea muscorum* Ach. Meth. p. 33 (1803) pro parte; Hook. in Sm. Engl. Fl. v. p. 177 pro parte; Leight. Lich. Fl. p. 342; ed. 3, p. 370. *L. bacillifera* subsp. *muscorum* Cromb. Lich. Brit. p. 74.

Exsicc. Leight. n. 190; Mudd n. 152; Larb. Lich. Hb. n. 273; Johns. n. 340.

Differs from the preceding, to which it is closely related, in the colour of the paraphyses and of the epithecium, and more especially in the habitat.

Hab. Incrusting mosses on the ground and on boulders in maritime and upland situations.—*Distr.* Not unfrequent in England; rare in N. Wales, the S.W. Highlands of Scotland, S. Ireland, and the Channel Islands.—*B. M.* Quenvais, Jersey; Shanklin, I. of Wight; near Hay Tor, Dartmoor, Devon; St. Merryn, Cornwall; Patcham, Sussex; Shiere, Surrey; Beeleigh, Essex; Bathampton Downs and Claverton Downs, Somerset; Tenby, Pembrokeshire; Gogmagog Hills, Cambridgeshire; Thetford Warren, Norfolk; Shiffnal, Shropshire; Whitman's Hill, near Malvern, Worcestershire; Dolgelly, Merioneth; Redcar, Cleveland, Yorkshire; Windermere, Westmoreland; Appin and Ballachulish, Argyll; Glen Fender, Blair Athole, Perthshire; Blarney, Cork; Croghan, Killarney, Kerry.

22. **B. atrosanguinea** Th. Fr. Lich. Scand. p. 354 (1874).—Thallus effuse, very thin, granulose, pale or whitish (K −, CaCl −), often little visible. Apothecia small, plane, thinly margined, black or blackish; paraphyses thickish, often bluish at the apices; hypothecium reddish-brown; epithecium somewhat blackish; spores acicular, 3–7-septate, 0,022–44 mm. long, 0,0025–35 mm. thick; hymenial gelatine bluish then wine-red with iodine.—*Biatora atrosanguinea* Hepp Flecht. Eur. n. 286 (1857). *Lecidea subincompta* Nyl. in Flora xlviii. p. 147 (1865); Cromb. in Grevillea xxii. p. 59.

Scarcely to be distinguished from *B. muscorum* except in habitat. There is no specimen in our British collection, but it has probably been overlooked, as it is common on the continent. *B. incompta* var. *atrosanguinea* Mudd Man. p. 184 may be a synonym, but a specimen in the herbarium so named by him is identical with *B. incompta*.

Hab. On the bark of trees.

Subsp. **oribata** A. L. Sm.—Thallus thinly subgranulose-verrucose, greyish-brown. Spores 3–5-septate, 0,023–40 mm. long, 0,003–4 mm. thick; otherwise as in the species.—*Lecidea oribata* Nyl. in Flora lvii. p. 16 (1874); Leight. Lich. Fl. ed. 3,

p. 372. *L. subincompta* subsp. *oribata* Cromb. in Grevillea ii. p. 141 (1874) & xxii. p. 59. Specimen not seen.

Apparently, as Nylander himself says, only a subspecies differing chiefly in the more developed thallus and the rather smaller spores.

Hab. On the ground among schistose rocks in a mountainous region. Collected by Dr. Stirton on Ben Lawers, Perthshire.

23. **B. circumpallens** A. L. Sm.—Thallus effuse, thin, rimose, pale-greyish. Apothecia small, plane or subconvex, brownish-black or brownish-red, the margin pale, at length excluded, within colourless; paraphyses thickish, somewhat lax; epithecium vaguely dark or almost colourless; hypothecium colourless; spores fusiform or fusiform-acicular, straight, 3-septate, 0,018–25 mm. long, 0,0020–35 mm. thick; hymenial gelatine pale-bluish then wine-red with iodine.—*Lecidea circumpallens* Nyl. in Flora xlix. p. 370 (1866); Carroll in Journ. Bot. v. p. 255 (1867); Leight. Lich. Fl. p. 336; ed. 3, p. 358. *L. bacillifera* var. *circumpallens* Cromb. Lich. Brit. p. 74 (1870); subsp. *circumpallens* Cromb. in Grevillea xxii. p. 58 (1893).

Hab. On clayey soil.—*Distr.* Rare in W. Ireland.—*B. M.* Ross and Kilkee, Clare.

24. **B. atrogrisea** Arnold in Flora xli. p. 505 (1858).—Thallus determinate or subeffuse, thin, rimulose or granulose, greyish-white or greenish-grey. Apothecia sessile, or adnate, at first plane with thick, smooth margin, at length somewhat convex, the margin excluded, black or purplish-black, within white or whitish; paraphyses slender, subdiscrete, clavate and blackish at the apices; epithecium infuscate (K + purplish-violet); hypothecium colourless; spores elongate-acicular, 3–15-septate, straight or slightly curved, 0,040–70 mm. long, 0,003–5 mm. thick; hymenial gelatine bluish then sordid wine-red with iodine.—Mudd Man. p. 183. *Biatora atrogrisea* Delise ex Hepp Flecht. Eur. n. 26 (1853). *Lecidea luteola* f. *endoleuca* Nyl. Bot. Not. 1853, p. 98; var. *endoleuca* Nyl. in Act. Soc. Linn. Bord. ser. 3, i. 1856 p. 360. *L. endoleuca* Nyl. ex Carroll in Nat. Hist. Rev. 1859, p. 527; Cromb. Lich. Brit. p. 74; Leight. Lich. Fl. p. 340; ed. 3, p. 367.

Exsicc. Carroll Lich. Hib. n. 23; Leight. n. 90 (as *Biatora premnea*); Larb. Lich. Hb. n. 349; Johns. n. 341.

Hab. On naked or mossy trunks of trees, rarely on stems of ivy, in maritime and upland situations.—*Distr.* Here and there in England, apparently rare in Scotland, more frequent in Ireland.—*B. M.* Kelvedon, Ulting and Hockley, Essex; near Lewes, Selham, Mount Harry and near Hastings, Sussex; near Lyndhurst, New Forest, Hants; Ilsham Walk, Torquay, Devon; Withiel, Cornwall; Bathampton Downs, Somerset; Oakley Park, Cirencester, Gloucestershire; Twycross, Leicestershire; Hollybush Hill, Malvern, Worcestershire; Nannau and Dolgelly, Merioneth; near Shrewsbury, Shropshire; Airyholme Wood, Cleveland, Yorkshire; Barcaldine,

Argyll; Kenmore, Perthshire; Tullagreen and near Rostellan, Cork Little Island and Dinish, Killarney, Kerry; Westport, Mayo; Adar Limerick; Letterfrack, Connemara, Galway.

Form **laurocerasi** A. L. Sm.—Thallus crowdedly rimulose subleprose, whitish. Apothecia convex, reddish-brown or part paler, immarginate, whitish within; spores 0,053–95 mm. lon 0,0040–45 mm. thick.—*Patellaria laurocerasi* Duby in DC. Bo Gall. p. 653 (1830). *Lecidea endoleuca* f. *laurocerasi* Nyl. Flora xlvii. p. 620 (1864); Cromb. Lich. Brit. p. 74.

Perhaps rather a state than a distinct form, differing in the lighte coloured apothecia, which are rather scattered in the two Britis specimens, and are obtusely margined only in a very young conditio

Hab. On ash and elm in maritime and upland districts.—*Dist* Rare in S. England and the Channel Islands.—*B. M.* Quenva Jersey; near Lyndhurst, New Forest, Hants.

25. **B. umbrina** Branth & Rostr. in Bot. Tidsskr. iii. p. 2 (1869).—Thallus subeffuse, thin, granulose-leprose or subareolat dark-greyish, dark-green, blackish or yellowish (K−, CaCl− sometimes subobsolete. Apothecia small, sessile, plane a thinly margined, at length convex, immarginate, brownish blackish; hypothecium colourless; paraphyses coherent, oliv brown or dark-greenish-blue at the apices; spores vermifor cylindrical, spirally curved, 3–5-pluri-septate, 0,020–40 mm. lon 0,0025–35 mm. thick; hymenial gelatine bluish then wine-r or violet with iodine.—*Lecidea umbrina* Ach. Lich. Univ. p. 1 (1810); Carroll in Journ. Bot. v. p. 255 (1867); Leight. Lic Fl. ed. 3, p. 359; f. *vermifera* Nyl. Lich. Scand. p. 209 (1861 *L. pelidna* Ach. *l. c.* p. 158; Cromb. Lich. Brit. p. 74; Leigh Lich. Fl. p. 344. *L. holomelæna* Floerke ex Spreng. Syst. Ve iv. p. 256 (1827) pro parte. *L. holomelæna* subsp. *vermifer* Cromb. Lich. Brit. p. 91 (1871). *Scoliciosporum vermiferu* Mudd Man. p. 185 (1861).

Exsicc. Leight. n. 158 (as *Lecidea vermifera*); Mudd n. 15 Johns. n. 342.

Easily recognized by the spirally-curved spores, which are usual pluriseptate, though sometimes apparently simple. The thall covers the substratum with a thin minutely broken crust. Th apothecia are numerous. Leighton's f. *leptomera* (*l. c.*) (*Lecid leptomera* Sommerf. Suppl. Fl. Lapp. p. 161 (1826)) has a somewh lighter thallus. Crombie cites as *Lecidea holomelæna*, *Biato holomelæna* Hepp (Flecht. Eur. n. 12 (1853)), a species that from i two-celled spores belongs to the genus *Biatorina*.

Hab. On rocks and stones, more rarely on old palings.—*Dist* General and common throughout the British Isles.—*B. M.* Boul Bay, Jersey; Launceston, Cornwall; Shoreham, Shermanbury a Wisborough Green, Sussex; Barmouth, Merioneth; near Oswestr Sutton, near Shrewsbury, Sliperstones and Lyth Hill, Shropshir Malvern, Worcestershire; Trefriw, Carnarvonshire; Buxton, Derb shire; near Easby, Cleveland, Yorkshire; High Force, Teesdal

Durham; near Portlethen, Kincardineshire; Canlochan, Forfarshire; Ben Lawers, Glen Fender and Craig Tulloch, Blair Athole, Perthshire; Upper Glen Dee, Braemar, Aberdeenshire; Glen Nevis, Lochaber, Invernessshire; near Macroom, Cork; Blackwater Bridge, Kerry; Kilree and Moher, Clare; Kylemore, Connemara, Galway.

Var. **turgida** Th. Fr. Lich. Scand. p. 365 (1874).—Thallus thin, effuse, crustaceous, minutely granular, light- or dark-greenish-brown. Apothecia small, numerous, paler than in the species; paraphyses paler at the tips.—*Scoliciosporum turgidum* Koerb. Parerg. Lich. p. 241 (1861). *Lecidea pelidna* var. *turgida* Cromb. Lich. p. 74 (1870); Leight. Lich. Fl. p. 345. *L. pelidniza* Nyl. in Flora lvii. p. 318 (1874). *L. umbrina* f. *turgida* Leight. Lich. Fl. ed. 3, p. 360 (1879); f. *pelidniza* Leight. *l. c.*

Exsicc. Larb. Lich. Hb. n. 182.

Distinguished by the lighter-coloured thallus and apothecia.

Hab. On rocks.—*Distr.* Rare in maritime or upland districts in S. and Central England, Wales, the N. Grampians, Scotland and W. Ireland.—*B. M.* Near Penzance, Cornwall; Dolgelly, Merioneth; Snowdon, Carnarvonshire; Glen Callater, Braemar, Aberdeenshire; Kilkee, Clare; Kylemore and Twelve Pins, Connemara, Galway.

Var. **compacta** Th. Fr. *l. c.*—Thallus dark-brown, almost black, thickish. Apothecia very dark; paraphyses dark-bluish-green towards the apices.—*Scoliciosporum compactum* Koerb. Syst. Lich. Germ. p. 268 (1855). *L. umbrina* f. *compacta* Leight. Lich. Fl. ed. 3, p. 360 (1879).

Hab. On rocks and walls.—*Distr.* Not unfrequent in England and Wales, rare in the S. Grampians, Scotland and W. Ireland.—*B. M.* Axe Edge, near Buxton, Derbyshire; Dolgelly, Merioneth; Ben Lawers, Perthshire; near Kylemore, Connemara, Galway.

26. **B. ascaridiella** A. L. Sm.—Thallus determinate, thin, opaque, rimulose, whitish (K −, CaCl −). Apothecia very minute, innate, blackish, colourless within, often with a pseudothalline crenulate margin; epithecium slightly brownish; hypothecium colourless; paraphyses very slender, not crowded; spores 8, 16 or 32 in the ascus, vermiform, acute at the apices, spirally-curved, pluriseptate, 0,025–30 mm. long, 0,0015–20 mm. thick; hymenial gelatine scarcely tinged with iodine.—*Lecidea ascaridiella* Nyl. in Flora li. p. 162 (1868); Carroll in Journ. Bot. vi. p. 100 (1868); Leight. in Ann. Mag. Nat. Hist. ser. 4, i. p. 483 (1868) & Lich. Fl. p. 355; ed. 3, p. 383; Cromb. Lich. Brit. p. 75.

A very minute species, placed by Nylander near to *Lecidea leucaspis*, a continental species. Examination shows that it is closely allied to the preceding; the spores are septate, not simple as originally described. The small specimen seen is well fertile.

Hab. On a calcareous rock in an upland mountainous district.—*B. M.* Mangerton, Killarney, Kerry.

27. **B. flavovirescens** Anzi Cat. Lich. Sondr. p. 71 (1860).—Thallus bright-greenish-yellow, effuse, thin or thickish, finely granular or pulverulent (K−, CaCl−); hypothallus filamentous, dark-brown or blackish. Apothecia black, solitary or conglomerate, appressed, at first concave, then plane, with a thickish obtuse margin, the disc granular; hypothecium brownish-black; paraphyses slender, hyaline, greenish-yellow in thick section; spores acicular, pluriseptate, 0,036–100 mm. long, 0,003–4 mm. thick; hymenial gelatine not tinged with iodine.—*Lichen flavovirescens* Dicks. Crypt. fasc. iii. p. 13 t. 8, f. 9 (1793); With. Arr. ed. 3, iv. p. 12. *L. citrinellus* Ach. in Vet. Acad. Handl. xvi. p. 135, t. 5, f. 5 (1795); Engl. Bot. t. 1877. *Lecidea citrinella* Ach. Meth. p. 15 (1803); S. F. Gray Nat. Arr. i. p. 466; Cromb. Lich. Brit. p. 94; Leight. Lich. Fl. p. 339; ed. 3, p. 336. *L. flavovirescens* Borr. ex Hook. in Sm. Engl. Fl. v. p. 178 (1833); Tayl. in Mackay Fl. Hib. ii. p. 122. *Raphiospora flavovirescens* Koerb. Syst. Lich. Germ. p. 268 (1855); Mudd Man. p. 186, t. 3, f. 70.

Exsicc. Leight. n. 303.

A conspicuous plant from the contrast between the brightly-coloured, scattered or continuous thallus and the dark substratum, to which it is loosely affixed. On account of the prominent, somewhat carbonaceous margin of the apothecium, and the elongate-acicular spores, it has been variously classified by authors under *Lecanactis* or *Raphiospora*. Th. Fries (Lich. Scand. p. 343 (1874)) regards *B. flavo-virescens* as a discomycetous fungus parasitic on the thallus of *Sphyridium byssoides* (*Bœomyces rufus*). The gonidia, he considers, belong to the latter plant, their bright colour being caused by the action of the parasite on the host. Rehm has included it in his genus *Mycobacidium* (Rabenh. Krypt.-Fl. i. 3, p. 338 (1896)), but states that the question of parasitism is by no means decided.

Hab. On the ground and among mosses on rocks in hilly or sub-alpine localities.—*Distr.* Apparently local, though plentiful where it occurs in England and Wales, common in the Highlands of Scotland, rare in Ireland.—*B. M.* Hay Tor, Dartmoor, Devon; Builth, Brecknockshire; Llyn Gwernon and Dolgelly, Merioneth; Oswestry, Shropshire; Bettws-y-Coed, Carnarvonshire; Llangollen, Denbighshire; Stavely, Westmoreland; Teesdale, Durham; near Helensburgh, Dumbartonshire; Glen Creran, Argyll; Glen Lochay, Killin, Craig Calliach, Ben Lawers, Rannoch and Craig Tulloch, Blair Athole, Perthshire; Canlochan Glen, Forfarshire; Morrone, Braemar, Aberdeenshire; Hills of Applecross, Rossshire; Wicklow; near Dunkerron, Kerry; Doughruagh Mt., Connemara, Galway.

Var. **alpina** A. L. Sm.—Thallus areolate, in crumb-like masses, sublobulate at the circumference. Apothecia plane or slightly convex, often congregate.—*Lecidea flavovirescens* var. *β alpina* Schær. Spicil. Lich. Helv. p. 162 (1833).

Distinguished by the more developed thallus. *Lichen flavovirescens* var. 2, With. (*l. c.*) erroneously referred by Crombie

(Grevillea xii. p. 58) to the variety (as f. *alpina*), is only a more granulose state of the species.

Hab. Incrusting mosses on rocks in an alpine situation.—*B. M.* Near the summit of Ben Lawers, Perthshire.

Var. **arenicola** A. L. Sm.—Thallus obsolete. Apothecia minute, scattered, the margin slightly inflexed and shining, otherwise as in the species.—*Lecidea citrinella* var. *arenicola* Nyl. ex Mudd Man. p. 187 (1861); Cromb. Lich. Brit. p. 94. *L. arenicola* Leight. Lich. Fl. p. 356; ed. 3, p. 386. *Raphiospora arenicola* Mudd Man. p. 186 (1861).

Exsicc. Leight. n. 372.

Differs from the species in being athalline and in the smaller, solitary, though numerous apothecia. The asci, when immature, are 6–8-spored, or even 4-spored (Leight. *ll. c.*).

Hab. On sandy soil and often parasitic on *Bæomyces rufus* in upland hilly districts.—*Distr.* Found only in a few localities of Great Britain and Ireland.—*B. M.* Goyt Lane, Buxton, Derbyshire; Wapley Hill, Herefordshire; Stiperstones, Shropshire; Loundsdale, Cleveland, Yorkshire; Craig Calliach, Ben Lawers and Rannoch, Perthshire; Countesswells Wood, near Aberdeen; Mweelan, near Kylemore, Connemara, Galway.

76. **BUELLIA** De Not. in Giorn. Bot. Ital. ii. p. 195 (1846) emend.; Koerb. Syst. Lich. Germ. p. 223 (1855).—*Diploicia* Massal. Ric. Lich. p. 86 (1852); Mudd Man. p. 168. *Abrothallus* De Not. *l. c.* p. 192; Mudd Man. p. 224. (Pl. 13.)

Thallus radiate-plicate (*Diploicia*), crustaceous or wanting (*Abrothallus*). Algal cells *Protococcus*. Apothecia usually dark-coloured and carbonaceous, immarginate or with a proper margin only; asci usually 8-spored; spores ellipsoid or oblong, usually 1-septate, brown, sometimes with a hyaline epispore (*halonate*).

Diploicia and *Abrothallus* have been included in *Buellia* on account of the similarity in the fruits. The species of *Abrothallus* are all parasitic on other Lichens, and have been described as fungi by some authors.

1. **B. canescens** De Not. in Giorn. Bot. Ital. ii. p. 197 (1846).—Thallus determinate, thickish, white or glaucous-white, adnate, usually orbicular, radiate-plicate and lobate at the circumference, generally smooth, pruinose, sorediate towards the centre (K + yellow, CaCl −). Apothecia rather rare, black, small, crowded towards the centre, adnate, plane and thinly margined, becoming slightly convex and immarginate; hypothecium brownish-black; paraphyses subdiscrete, thick, black at the apices; spores oblong-elliptical, obtuse at the ends, brown or blackish-brown, 0,011–14 mm. long, 0,006–7 mm. thick; hymenial gelatine deep-blue with iodine.—*Lichenoides crustosum, orbiculare incanum* Dill. Hist. Musc. p. 135, t. 18, f. 17A (1741). *Lichen canescens* Dicks. Pl. Crypt. i. p. 10, t. 2, f. 5 (1785); With. Arr.

ed. 3, iv. p. 9; Engl. Bot. t. 582. *L. incanus* Relh. Fl. Cantab. p. 424 (1785)? *Lecidea canescens* Ach. Meth. p. 83 (1803); Tayl. in Mackay Fl. Hib. ii. p. 130; Cromb. Lich. Brit. p. 76; Leight. Lich. Fl. p. 302; ed. 3, p. 313. *Placodium canescens* DC. Fl. Franc. ii. p. 379 (1805); Hook. in Sm. Engl. Fl. v. p. 197. *Lepidoma canescens* S. F. Gray Nat. Arr. i. p. 462 (1821). *Diploicia canescens* Massal. Ric. Lich. p. 86, fig. 177 (1852); Mudd Man. p. 169, t. 3, fig. 60.

Exsicc. Dicks. Hort. Sicc. Brit. n. 24; Leight. n. 62; Larb. Lich. Hb. n. 104 & Lich. Cæsar. n. 33; Carroll Lich. Hib. n. 18; Cromb. n. 178.

Apt at first sight to be confused with *Placodium candicans*, but well distinguished by the form of the black apothecia and the dark-coloured spores.

Hab. On old trees, rocks, and walls.—*Distr.* Frequent in the Channel Islands, England, and Ireland; somewhat rare in Scotland and Wales.—*B. M.* Huet Bay, Guernsey; Fliquet Bay, Jersey; Sark; I. of Wight; near Penzance and St. Minver, Cornwall; Tregantle, Devon; Netley Abbey and near Lymington, Hants; Glynde, Beeding Priory, Hurstpierpoint, Aldrington, Angmering, Boxgrove, Ardingly, and near Lewes, Sussex; near Cheam, Surrey; Hythe, Lydd, and Penshurst, Kent; near Hendon, Middlesex; Danbury Park, Ulting, and Walthamstow, Essex; near Elstree, Herts; Windsor Great Park, Berks; Lechlade, Gloucestershire; Whittington and Norton, Worcestershire; Gopsall Park and Twycross, Leicestershire; Dolgelly and Aberdovey, Merioneth; Wimpole Park and Gamlingay, Cambridgeshire; Ickworth, Suffolk; Yarmouth and Eaton, Norfolk; Baston Hill, Lincoln; Pwllheli, Carnarvonshire; Harboro' Magna, Warwickshire; Clifton Grove, Nottinghamshire; near Ayton, Cleveland, Yorkshire; Gainsford, Durham; Hexham, Northumberland; Queen's Park, near Edinburgh; Den of Mains, Forfarshire; Nigg, Kincardineshire; Ballachulish, Argyll; Dromoland, Agharda and Middleton, Cork; Carrigogunnel, Limerick; Coolmore, Donegal.

2. **B. epigæa** Tuckerm. Gen. Lich. p. 185 (1872).—Thallus whitish, orbicular, radiate-plicate at the circumference, farinose, sometimes reduced to scattered squamules. Apothecia black, subsessile, plane, becoming convex, whitish- or bluish-pruinose, the margin thin, at first prominent, at length disappearing; hypothecium brown or blackish-brown; paraphyses loosely coherent, often septate, dark-brownish-black at the apices; spores elliptical, obtuse at the ends, sometimes constricted in the middle, 0,016–21 mm. long, 0,007–9 mm. thick.—*Lichen epigæus* Pers. in Ust. Ann. vii. pp. 25, 155 (1794). *Lecidea epigæa* Schær. Spicil. Lich. Helv. p. 118 (1828).

Exsicc. Larb. Lich. Hb. n. 312.

Somewhat similar to the preceding, but differs in the non-sorediate thallus and the larger spores.

Hab. On the ground.—*B. M.* Thetford Warren, Norfolk.

3. **B. alocizoides** A. L. Sm.—Thallus whitish-grey, thin, tartareous, pulverulent or almost evanescent (K−, CaCl−). Apothecia scattered, punctiform, immersed, then superficial, adnate, plane, brownish-black (paler when moist), with a paler margin; hypothecium colourless or faintly brownish; paraphyses subdiscrete, clavate and brown at the apices; spores rounded-oblong, dark-brown, 0,014–16 mm. long, 0,007–9 mm. thick.—*Lecidea alociza* Cromb. in Journ. Bot. ix. p. 178 (1871) (non Massal.); Leight. Lich. Fl. p. 310. *L. alocizoides* Leight. Lich. Fl. ed. 3, p. 325 (1879).

Characterized by the absence of areolation in the thallus and the minute emerging apothecia with colourless hypothecium.

Hab. On rocks chiefly calcareous.—*Distr.* Rare in central England and N. Wales.—*B. M.* Buxton, Derbyshire; Eglwyseg Rocks and Llandudno, Denbighshire.

4. **B. spuria** Koerb. Parerg. Lich. p. 183 (1860).—Thallus dull-ash-greyish, smooth and cracked, areolate or in scattered warts and granules; hypothallus blackish. Apothecia black, small, appressed or somewhat prominent, plane, with a thin evanescent margin; hypothecium colourless or brownish; paraphyses loosely coherent, dark-brown or olive-brown at the clavate apices; spores elliptical or oblong-elliptical, obtuse at the ends, somewhat slightly constricted, dark-brown, 0,008–15 mm. long, 0,004–7 mm. thick.—*Lecidea spuria* Schær. Spicil. Lich. Helv. p. 127 (1828) & Enum. p. 114 (1850); Leight. Lich. Fl. ed. 3, p. 318. *Buellia verruculosa* var. *β spuria* Mudd Man. p. 215 (1861).

Exsicc. Leight. n. 217 pro parte.

Distinguished from *B. verruculosa*, a variety of which Mudd regarded it, by the colourless hypothecium.

Hab. On rocks.—*Distr.* Rare in W., Central and N. England and Wales; not recorded from Scotland or Ireland, but probably overlooked.—*B. M.* Lynmouth, Devon; Lyth Hill, Shropshire; Carlton Bank, Cleveland and near Ayton, Yorkshire.

5. **B. occulta** Koerb. Parerg. Lich. p. 186 (1860).—Thallus greyish-yellow, effuse, thin, minutely cracked-areolate, the areolæ somewhat convex (K + yellow, CaCl−); hypothallus black. Apothecia minute, blackish-brown, adnate and margined by the thallus, becoming convex, the proper margin more or less visible; hypothecium yellowish; paraphyses indistinct, dark-brown and clavate at the tips; spores ellipsoid, 0,014–17 mm. long, 0,007–8 mm. thick.—*Lecidea occulta* Leight. in Grevillea i. p. 58, t. 4, f. 6 (1872), & Lich. Fl. ed. 3, p. 325. *L. leucoclinella* Nyl. ex Cromb. in Journ. Bot. ix. p. 179 (1871) & xi. p. 135 (1873); Leight. Lich. Fl. p. 310; ed. 3, p. 325.

Exsicc. Leight. n. 217 pro parte.

Differs from the preceding in the colour of the thallus, which is thinner and often somewhat scattered. Crombie (*l. c.*) included

Leighton's *Exsicc.* n. 189 (*L. verruculosa*) under *L. leucoclinella*, but the British Museum specimen is a form of *Rhizocarpon confervoides*. There are no authentic specimens in the herbarium except those cited from Leighton.

Hab. On rocks.—*Distr.* Rare in Central England and Wales.—*B. M.* Lyth Hill, Shropshire; Bettws-y-Coed, Carnarvonshire.

6. **B. discolor** Koerb. Parerg. Lich. p. 185 (1860).—Thallus pale-greyish-brown, thin, tartareous, minutely cracked-areolate or almost continuous, the areolæ plane (K + yellow, CaCl + yellow), limited by a more or less conspicuous dark-brown hypothallus. Apothecia blackish-brown, minute, numerous, adnate or subinnate, plane with a thickish persistent margin; hypothecium colourless; paraphyses distinct, dark-brown at the apices; spores ellipsoid, almost colourless, then dark-brown, the large guttulæ of the cells connected by a tube, 0,019–21 mm. long, 0,010–11 mm. thick.—*Lecidea discolor* Hepp Flecht. Eur. nos. 319 & 320 (1857); Leight. Lich. Fl. ed. 3, p. 325.

Exsicc. Johns. n. 356.

Hab. On rocks and stones.—*Distr.* Somewhat rare in S. and N. England and S. Ireland.—*B. M.* Sea-banks between Whitehaven and St. Bees, Cumberland.

7. **B. interpolata** A. L. Sm.—Thallus determinate, blackish-brown or black, minutely squamulose-areolate, the areolæ appressed, contiguous or dispersed, hypothallus black. Apothecia black, small adnate, plane, marginate; hypothecium colourless; paraphyses slender not well discrete, the apices clavate, brownish-black; spores ellipsoid, greenish or dark-brown, the large guttulæ of the cells sometimes conjoined by a tube; hymenial gelatine blue then dark-violet, the asci wine yellow, with iodine.—*Lecidea interpolata* Stirton in Scott. Nat. iv. p. 165 (1877); Leight. Lich. Fl. ed. 3, p. 326. Specimen not seen.

Hab. On rocks. Collected by Dr. Stirton near Garve, Rossshire.

8. **B. biloculata** A. L. Sm.—Thallus in patches, effuse, silvery-white. Apothecia black, adnate, small, marginate; hypothecium brown; paraphyses clavate and brown at the apices; spores ellipsoid-fusiform, brown, the two cells connected by a tube, 0,015–18 mm. long, 0,008 mm. thick; hymenial gelatine deep blue with iodine.—*Lecidea biloculata* Nyl. in Flora lx. p. 460 (1877); Cromb. in Grevillea vi. p. 113. Specimen not seen.

Hab. On bark of holly. Collected by Larbalestier near Kylemore, Connemara, Galway.

9. **B. polospora** A. L. Sm.—Thallus white or glaucous-white, thin, filmy, effuse and somewhat shining, unequal or wrinkled (K −, CaCl −). Apothecia minute, black, plane, with a narrow, slightly prominent margin becoming somewhat convex and

immarginate; hypothecium blackish-brown; paraphyses distinct, thickish, globular and blackish brown at the apices; spores dark-brown, ellipsoid, with a paler brown, roundish cell at each apex, 0,020–22 mm. long, 0,009 mm. thick; hymenial gelatine deep blue with iodine.—*Lecidea polospora* Leight. in Trans. Linn. Soc. ser. 2, i. p. 241, t. 33, figs. 4–6 (1878), & Lich. Fl. ed. 3, p. 313. Specimen not seen.

Resembling *B. myriocarpa*, but distinguished by the peculiar spores which are 3-celled, though described by Leighton as polari-bilocular.

Hab. On hawthorn.—*Distr.* Collected by Larbalestier at Ballynahinch, Galway.

10. **B. myriocarpa** Mudd Man. p. 217 (1861), (incl. var. *punctiformis*).—Thallus effuse, greenish-grey or blackish, unequal, granular or pulverulent (K −, CaCl −), sometimes evanescent. Apothecia minute, plane or convex, with a thin disappearing margin; hypothecium blackish-brown; paraphyses discrete, clavate or capitate and dark-brown at the extreme tips; spores oblong, dark-brown, rarely constricted, epispore distinct, 0,009–16 mm. long, 0,004–8 mm. thick; hymenial gelatine deep blue with iodine.—*Patellaria myriocarpa* DC. Fl. Fr. ii. p. 346 (1805). *Lichen graniformis* With. Arr. ed. 3, iv. p. 7 (1796) fide Cromb. in Grevillea xii. p. 57 (1883) (non Hagen). *L. pinicola* Ach. Prod. Lich. Suec. p. 66 (1798); Engl. Bot. t. 1851, fig. 1. *Lecidea pinicola* Borr. ex Hook. in Sm. Engl. Bot. v. p. 176 (1833). *L. myriocarpa* Nyl. in Act. Soc. Linn. Bord. ser. 3, i. p. 387 (1856)|; Cromb. Lich. Brit. p. 88; Leight. Lich. Fl. p. 307; ed. 3, p. 319; f. *pinicola* Leight. *l. c.*

Exsicc. Bohl. n. 102, Carroll Lich. Hib. n. 20; Mudd nos. 189, 190; Leight. nos. 63, 181; Larb. Lich. Hb. nos. 32, 33 (f. *saprophila*), 34, 69 (f. *leprosa*) 147, 229, 266, 343, 344; Johns. nos. 358, 359, 389, 390 (f. *leprosa*).

Externally resembling *Lecidea parasema*, but with usually smaller apothecia, a character specially emphasized in var. *punctiformis* Mudd. Spermogonia are somewhat frequent, the spermatia cylindrical, curved or undulated, 0,018–23 mm. long, 0,001 mm. thick. The thallus varies from being thin and almost obsolete to more or less granular or pulverulent, and these variations have been described in a number of forms by Leighton. In Lich. Fl. ed. 3, p. 319, he records two forms with an evanescent thallus, f. *quercicola* found on oaks, and f. *saprophila* (non *Lecidea parasema* var. *saprophila* Ach.) on decaying wood, with somewhat larger apothecia. Among saxicolous forms he distinguishes f. *areolata* (in Grevillea v. p. 84 (1876) and Lich. Fl. ed. 3, p. 320), characterized by the minutely cracked-areolate thallus; f. *leprosa* (*ll. c.*), in which the greyish thallus has become entirely pulverulent; also f. *ecrustacea* and f. *opegraphina* without any visible thallus, the latter further characterized by the apothecia being more or less clustered in lines. *B. vernicoma* Tuckerm. Gen. Lich. p. 187 (1872) (*Lecidea vernicoma* Leight. Lich. Fl. ed. 3, p. 321) has been recorded by Larbalestier from Jersey, but the specimens

seen by Leighton, and those in the British Museum, including Larb. Lich. Hb. n. 34, do not agree with the description of Tuckerman's species; they are mostly saxicolous forms of *B. myriocarpa*, but one of the specimens is *Biatorina lenticularis*, the form of the paraphyses in both these species being very similar.

Hab. On trees, palings and rocks.—*Distr.* Frequent throughout the British Isles.—*B. M.* Lignicolous: Jersey; Lustleigh, Devon; Lyndhurst and near Menstrie, New Forest, Hants; St. Leonards, Chiltington and Shermanbury, Sussex; Penshurst, Kent; Richmond Park, Surrey; Hammersmith and Hampstead Heath, Middlesex; Windsor Great Park, Berks; near Cirencester, Gloucestershire; Lewknor and Wheatfield, Oxfordshire; Highbeach, Epping Forest, Walthamstow, Hockley Woods, Ulting, Stansted, Mount Fitchet, Broomfield and Hatford Peverel, Essex; Babraham and Gamlingay (f. *saprophila*), Cambridgeshire; near Tuddenham, Suffolk; Thetford Warren and near King's Lynn, Norfolk; near Pixham Ferry, Worcestershire; Polesworth and Leamington, Warwickshire; near Shrewsbury, Battlefield, Church Stretton, Haughmond Hill and Newport, Shropshire; Elmhurst, Staffordshire; Twycross, Leicestershire; Barmouth and Dolgelly, Merioneth; Bettws-y-Coed, Carnarvonshire; near Stokesley, Cleveland, Yorkshire; Teesdale, Durham; Orton, Westmoreland; Keswick and Ennerdale, Cumberland; Killin and Aberfeldy, Perthshire; Loch Lomond, Dumbartonshire; Appin, Argyll; Mar Forest, Braemar and Countesswells, near Aberdeen; Applecross, Rossshire; Riverstown, Glanmire and Blarney, Cork; Torc Mt., Killarney; Ballynagarde, Limerick; Killaloe and Kilkee, Clare; near Belfast, Antrim. Saxicolous: Fliquet Bay and La Moye, Jersey; Lewes, Sussex; Shiere, Surrey; Goodwick Bay, Pembrokeshire; Charnwood Forest, Leicestershire; Hale End, Malvern, Worcestershire; Lyth Hill, Shropshire; Cliffrigg, Cleveland, Yorkshire; Portlethen, Kincardineshire; Countesswells Woods near Aberdeen (on *Bœomyces rufus*); Inniscarra and Kilcully, Cork; Kilkee, Clare; Mweelen, Kylemore, near Salrock and near Lough Feagh, Connemara, Galway.

Var. **chloropolia** Th. Fr. Lich. Scand. p. 595 (1874).—Thallus thicker than in the species, greenish-grey, unequal, granular.—*Lecidea chloropolia* Fr. Summa p. 115 (1846) nomen. *L. myriocarpa* f. *chloropolia* Leight. Lich. Fl. ed. 3, p. 319 (1879). *Lichen pinicola* Sm. Engl. Bot. t. 1851 fig. 2 (1808).

Exsicc. Larb. Lich. Hb. n. 31.

Scarcely to be distinguished from some forms of the species. The apothecia are somewhat larger, and are comparable to Leighton's f. *saprophila*.

Hab. On decorticated trunks and old palings.—*Distr.* Somewhat rare in the Channel Islands, S., Central and N. England.—*B. M.* Beaufort, Jersey; near Bovey Tracey, Devon; Lyndhurst, New Forest; Finchley, Middlesex; Walthamstow, Essex; near Cambridge.

11. **B. Schæreri** De Not. in Giorn. Bot. Ital ii. p. 199 (1846).—Thallus effuse, thin, whitish, minutely granular or pulverulent, sometimes evanescent (K−, CaCl−). Apothecia minute, black, plane or subconvex, the margin thin, disappearing; hypothecium brownish or dark-brown; paraphyses concrete dark-brown at the

tips; spores oblong or oblong-ellipsoid, pale-greenish-brown, small, 0,006–10 mm. long, 0,002–4 mm. thick.—*B. nigritula* Mudd Man. p. 217 (1861). *Lecidea nigritula* Nyl. in Bot. Not. 1853, p. 99; Cromb. Lich. Brit. p. 89; Leight. Lich. Fl. p. 307; ed. 3, p. 321.

Closely resembling some forms of the preceding, but differing in the small size and paler colour of the spores.

Hab. On trunks of trees and on wood.—*Distr.* Rare in S., Central and N. England.—*B. M.* New Forest, Hants; Trefriw, Carnarvonshire; Farndale, Yorkshire; Levens Park, Kendal, Westmoreland.

12. **B. præcavenda** A. L. Sm.—Thallus effuse, very thin, blackish-green, scarcely visible (K −, CaCl −). Apothecia subminute, plane or slightly concave, thinly margined, reddish-brown or black; paraphyses slender, conglutinate, dark-amber-brown at the tips, forming a reddish-brown epithecium; hypothecium (especially above) reddish-brown; spores ellipsoid, reddish-brown, 0,014–17 mm. long, 0,006–8 mm. thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea præcavenda* Nyl. in Flora lii. p. 411 (1869); Cromb. in Journ. Bot. vii. p. 232 (1869) & Lich. Brit. p. 88; Leight. Lich. Fl. p. 309; ed. 3, p. 323.

Distinguished by the biatorine character of the apothecia and by the reddish colour internally. In the single specimen gathered the thallus and apothecia are sparingly present, and are interspersed with a sphæriaceous fungus.

Hab. On a decaying holly.—*B. M.* Near Lyndhurst, New Forest, Hants.

13. **B. æthalea** Th. Fr. Lich. Scand. p. 604 (1874).—Thallus effuse, thin or thickish, minutely cracked-areolate, greyish or brownish-grey (K + yellow then red, CaCl −); hypothallus black. Apothecia minute, innate, concave or almost plane, with a thin prominent margin; hypothecium brownish or dark-brown; paraphyses coherent, dark-brown at the apices; spores ellipsoid, usually constricted at the septum, dark-brown, 0,010–15 mm. long, 0,006–8 mm. thick; hymenial gelatine deep blue with iodine. — *B. badioatra* var. *atroalbella* Mudd Man. p. 214 (1861). *Gyalecta æthalea* Ach. Lich. Univ. p. 669 (1810). *Lecidea atroalba* var. *atroalbella* Nyl. Obs. Syn. Lich. Holm. p. 6 (1853). *L. atroalbella* Leight. Lich. Fl. p. 310 (1871); ed. 3, p. 324. *L. æthalea* Stiz. in Jahresber. St. Gall. Nat. Ges. p. 456 (1882); Cromb. in Journ. Bot. xx. p. 275 (1882).

Exsicc. Mudd n. 185 (as *B. coracina*); Leight. n. 184 (as *Lecidea atroalba* var. *atroalbella*).

The thallus is typically very thin, the areolæ being contiguous or dispersed on a black hypothallus; when more developed the areolæ are more compact and deeply cracked.

Hab. On quartzose and schistose rocks.—*Distr.* Rather rare in maritime and upland districts.—*B. M.* Lyth Hill and near Church

Stretton, Shropshire; Easby, Lounsdale and Battersby, Cleveland, Yorkshire; I. of Lismore and Barcaldine, Appin, Argyll; Lough Feagh, Connemara, Galway.

14. **B. succedens** A. L. Sm.—Thallus effuse, thin, granulate, unequal or subareolate, whitish. Apothecia submoderate, margined, brownish-black; paraphyses moderate, jointed, thickened and brownish at the apices; hypothecium brown or reddish-brown; spores ellipsoid, simple or 1-septate, blackish, 0,011–14 mm. long, 0,0045–0,0055 mm. thick; hymenial gelatine bluish then wine-red with iodine.—*Lecidea succedens* Nyl. in Flora xlix. p. 372 (1866); Leight. in Ann. Mag. Nat. Hist. ser. 3, xix. p. 322 (1867) & Lich. Fl. p. 308; ed. 3, p. 322; Carroll in Journ. Bot. v. p. 258 (1867); Cromb. Lich. Brit. p. 89. Specimen not seen.

Closely allied with *L. secedens* Nyl., a corticolous species of N.W. France.

Hab. On a mica-schist rock on one of the S. Grampians (Ben Lawers, Perthshire).

15. **B. verruculosa** Mudd Man. p. 215 (1861) (excl. var. *spuria*).—Thallus effuse, minutely cracked-areolate, the areolæ scattered or contiguous, plane or slightly convex, smooth, yellowish-green (K −, CaCl + orange-red, medulla I −); hypothallus blackish, often little visible. Apothecia black, minute, innate, almost plane, thinly margined, becoming convex and immarginate; hypothecium dull-brown; paraphyses coherent, brown at the clavate apices; spores oblong, sometimes slightly constricted at the septum, brown, 0,012–16 mm. long, 0,006–9 mm. thick; hymenial gelatine deep-blue with iodine.—*B. ocellata* Koerb. Syst. Lich. Germ. p. 224 (1855). *Lichen verruculosus* Borr. in Engl. Bot. t. 2317 (1812). *Lecidea verruculosa* Borr. ex Hook. in Sm. Engl. Fl. v. p. 174 (1833); Leight. Lich. Fl. p. 303; ed. 3, p. 315. *L. ocellata* Floerke ex Flot. in Flora xi. p. 691 (1828); Cromb. in Journ. Bot. vii. p. 108 (1869) & Lich. Brit. p. 93. *L. kaleida* Tayl. in Lond. Journ. Bot. vi. p. 150 (1847).

Exsicc. Mudd n. 186.

Differs from *B. spuria* in the colour of the thallus and in the larger spores. The hypothecium in both these species is brown in thick section, but paler in thin section.

Hab. On rocks and flints.—*Distr.* Somewhat rare in maritime and upland regions.—*B. M.* Lydd Beach, Kent; Carlton Bank, Cleveland, Yorkshire; Muggleswick Hill, Durham; Lamplugh, Cumberland; Craig Tulloch, Blair Athole, Perthshire; near Cork; Blackwater Bridge, Lough Caragh and Dunkerron, Kerry.

Subsp. **præponens** A. L. Sm.—Thallus determinate, warted-areolate or thinly granular, yellowish-green. Apothecia small,

subinnate, uneven, immarginate; spores 0,015–17 mm. long, 0,008–10 mm. thick.—*Lecidea ocellata* subsp. *præponens* Nyl. in Flora li. p. 347 (1868); Cromb. in Journ. Bot. vii. p. 108 (1869) & Lich. Brit. p. 94. *L. verruculosa* var. *præponens* Leight. Lich. Fl. p. 304; ed. 3, p. 316.

Hab. On rocks in maritime regions.—*B. M.* Near Cove and Nigg, Kincardineshire (the only localities).

16. **B. saxatilis** Koerb. Syst. Lich. Germ. p. 228 (1855).—Thallus thickish, unequal, cracked, faintly yellowish-white or greyish (K−, CaCl−). Apothecia black, minute, scattered, innate, then sessile, plane, the margin entire, sometimes prominent; hypothecium blackish-brown; paraphyses subcoherent, capitate and blackish-brown at the apices; spores ellipsoid, dark-brown, 0,009–14 mm. long, 0,004–6 mm. thick; hymenial gelatine blue, the asci wine-red but blue at the tips, with iodine.—Mudd Man. p. 216. *Calicium saxatile* Schær. in Meisner's Nat. Anz. no. 5, 1821, p. 35 & Enum. p. 166. *Lecidea saxatilis* Hepp Flecht. Eur. n. 145 (1853); Cromb. Lich. Brit. p. 89; Leight. Lich. Fl. p. 303; ed. 3, p. 315.

Approaching *B. verruculosa*, but distinguished by the unequal, thicker thallus, and by the more prominent apothecia.

Hab. On rocks.—*Distr.* Rare in maritime and upland districts in Wales, E. Scotland and in N. and W. Ireland.—*B. M.* Nigg, Kincardineshire.

17. **B. ryssolea** A. L. Sm.—Thallus whitish-grey, thick, tartareous, cracked-areolate, the areolæ plane or somewhat convex, irregularly wrinkled (K + yellow, then red), limited by the black hypothallus. Apothecia numerous, rather large, prominent, blackish-brown, rusty, with a thick, paler margin; hypothecium thick, blackish-brown; paraphyses indistinct, thickened and blackish-brown at the apices; spores dark-brown, 0,016–17 mm. long, 0,007–8 mm. thick; hymenial gelatine pale-dirty-blue with iodine.—*Lecidea ryssolea* Leight. in Trans. Linn. Soc. ser. 2, i. p. 237 (1878) & in Lich. Fl. ed. 3, p. 324. Specimen not seen.

Hab. On Caradoc sandstone rocks.—*Distr.* Rare in S.W. Wales (Fort Hill near Fishguard, Pembrokeshire).

18. **B. saxorum** Massal. Ric. Lich. p. 82 (1852).—Thallus thin, minutely cracked-areolate, plane, dirty-yellowish-white (K + yellow, CaCl + red), limited by the black hypothallus. Apothecia numerous, scattered, sessile, plane, black, the margin thick, rather paler; hypothecium black or blackish-brown; paraphyses slender, capitate, the epithecium dull-brown; spores elliptical or subovoid, 0,013–17 mm. long, 0,006–8 mm. thick; hymenial gelatine blue then yellowish-brown with iodine.—

Lecidea saxorum Hepp Flecht. Eur. n. 752 (1867); Leight. Lich. Fl. p. 302; ed. 3, p. 314.

Differs from *B. leptocline* in the very marked limiting hypothallus; from *B. subdisciformis* in the reaction with potash.

Hab. On rocks.—*Distr.* Rare in the Channel Islands and N. England.

19. **B. excelsa** A. L. Sm.—Thallus white, thin, effuse, areolate-cracked, the areolæ plane and flat, somewhat shining, at times scattered or almost obsolete (Kf + yellow, CaClf + yellow). Apothecia black or violet-black, small, innate, plane or somewhat concave, margin thickish, prominent; hypothecium blackish-brown; paraphyses indistinct, blackish-brown and thicker at the apices; spores dark-brown, oblong, 0,015 mm. long, 0,007 mm. thick.—*Lecidea excelsa* Leight. in Grevillea iv. p. 78 (1876) & Lich. Fl. ed. 3, p. 323.

Hab. On mica-schist rocks.—*B. M.* Summit of the Doughruagh Mt., Connemara, Galway.

20. **B. leptocline** Koerb. Syst. Lich. Germ. p. 225 (1855) (excl. syn. *B. saxorum*).—Thallus whitish or greyish-white, warted- or cracked-areolate; hypothallus indistinct. Apothecia sessile or adnate, plane or becoming convex, the margin prominent then excluded; hypothecium blackish-brown; paraphyses coherent, dark-brown at the capitate tips; spores ellipsoid, blackish-brown, 0,012–16 mm. long, 0,006–9 mm. thick; hymenial gelatine deep-blue with iodine.—*Lecidea leptocline* Flot. in Bot. Zeit. viii. p. 555 (1850).

Var. **Mougeotii** Th. Fr. Lich. Scand. p. 598 (1874).—Thallus whitish, granular-dispersed or evanescent. Apothecia prominent, small, black, not pruinose; spores 0,011–16 mm. long, 0,006–8 mm. thick.—*Lecidea Mougeotii* Hepp Flecht. Eur. n. 311 (1857). *L. hypopodioides* Nyl. in Flora l. p. 372 (1867).

Hab. On rocks in mountainous regions.—*B. M.* Craig Tulloch, Blair Athole, Perthshire.

Var. **gevrensis** Th. Fr. *l. c.*—Apothecia often angular and crenate, more or less covered with an æruginous, green powder, the margin black, naked, otherwise as in the species.—*Buellia gevrensis* Th. Fr. in Bot. Not. 1865, p. 111. *Lecidea gevrensis* Cromb. var. *prolata* Nyl. ex Cromb. in Grevillea i. p. 173 (1873). Specimen not seen.

Hab. On rocks. Found by Crombie on Cairn Gowar, Blair Athole, Perthshire.

21. **B. leptoclinoides** Steiner in Verh. K. K. Zool.-Bot. Ges. Wien lvii. p. 357 (1907).—Thallus thin, greyish, cracked-areolate, the areolæ plane or slightly turgid (K + yellow, CaCl −). Apo-

thecia black, concave then plane, with a thickish margin; hypothecium reddish-brown; paraphyses slender, lax, faintly septate, brown at the capitate tips; spores always 8 in the ascus, ellipsoid or ovoid, straight or curved, 0,010–15 mm. long, 0,006–9 mm. thick.—*Lecidea leptoclinoides* Nyl. in Bull. Soc. Linn. Norm. ser. 2, vi. p. 311 (1872). Specimen not seen.

Hab. On rocks.—*Distr.* Rare in the Channel Islands (Jersey, collected by Larbalestier, *fide* Steiner).

22. **B. stellulata** Mudd Man. p. 216.—Thallus suborbicular, thin, minutely cracked-areolate, the areolæ plane, smooth, white or greyish-white (K + yellow, CaCl −, medulla I −); hypothallus thin, black. Apothecia minute, subinnate, crowded, plane, black, margined, the margin thin, entire; hypothecium brownish-black; paraphyses coherent, brownish-black at the apices; spores ellipsoid, 0,009–12 mm. long, 0,004–5 mm. thick; hymenial gelatine bluish with iodine.—*Lecidea stellulata* Tayl. in Mackay Fl. Hib. ii. p. 118 (1836); Carroll in Nat. Hist. Rev. 1859, p. 528; Cromb. Lich. Brit. p. 86; Leight. Lich. Fl. p. 304; ed. 3, p. 316.

Exsicc. Leight. n. 276; Larb. Cæsar. n. 38 & Lich. Hb. n. 311.

In a less developed condition the thallus, as noticed by Taylor, occurs in small patches usually less than an inch in diameter; but these afterwards become confluent, the thallus eventually attaining a diameter of 4 inches or more. The areolæ, aggregate in the perfect plant, are at times somewhat scattered (form *dispersa* Leight. Lich. Fl. ed. 3, p. 316). The numerous apothecia are crowded, and here and there confluent (form *confluens* Leight. *l. c.*), when the margin is obliterated.

Hab. On rocks and stones in maritime, rarely in mountainous districts.—*Distr.* Not unfrequent in the Channel Islands, S. and W. England, S. and N.E. Ireland; very rare in the S.W. Highlands of Scotland.—*B. M.* Portelet Bay and La Moye, Jersey; Cobo Bay, Guernsey; Sark; Alderney; Lydd Beach, Kent; Hastings, Aldrington Beach and near Brighton, Sussex; Shanklin, I. of Wight; Whitesand Bay, St. Merryn and Kynezal Cliff, near Penzance, Cornwall; Torquay, Devon; Fort Hill, Fishguard, Pembrokeshire; Dolgelly and Barmouth, Merioneth; Gimlet Rock, Pwllheli and Borth, Cardiganshire; Capel Curig, Carnarvonshire; Barcaldine, Argyll; near Ardglass, Down; Kinsale, Cork; Killarney, Kerry; Carrigogunnel, Limerick.

23. **B. impressula** A. L. Sm.—Thallus whitish-grey, thin, filmy, areolate (K + yellow then red), limited by the black hypothallus. Apothecia black, minute, numerous and crowded into small groups of three or more, impressed in the thallus, each apothecium circumcised so as to appear surrounded by a thin thalline margin; hypothecium thin, blackish-brown; paraphyses indistinct, the hymenium tinged with brown; spores roundish-oblong, more or less constricted in the middle, brown, 0,014–15 mm. long, 0,009 mm. thick; hymenial gelatine dull-blue with iodine.—*Lecidea impressula* Leight. in Trans. Linn. Soc. ser. 2,

i. p. 237, t. 32, figs. 1 & 2 (1878) & Lich. Fl. ed. 3, p. 324. Specimen not seen.

Considered by Leighton to be allied to the preceding, but differs in the appearance of the apothecia and in the larger spores. By the contiguous growth of several plants on the same stone, the surface becomes intersected by dark lines.

Hab. On bluish-grey slates.—*Distr.* Rare in hilly regions in Wales.

24. **B. subdisciformis** Jatta Syll. Lich. Ital. p. 392 (1900). —Thallus determinate, thickish, minutely cracked-areolate, the areolæ plane, sordid-yellowish-white (K + yellow then red, CaCl −, medulla I −); hypothallus black, limiting the thallus. Apothecia sessile, plane, marginate, blackish, more or less pruinose, the margin thick, entire, paler; hypothecium black; paraphyses discrete; hymenium pale-brown; spores oblong, brown, 0,011–16 mm. long, 0,007–8 mm. thick.—*Lecidea subdisciformis* Leight. Lich. Fl. p. 308 (1871); ed. 3, p. 322.

Exsicc. Larb. Lich. Cæsar. n. 35.

Distinguished from allied species by the strongly marked hypothallus which occasionally intersects the thallus, and by the chemical reaction.

Hab. On rocks.—*Distr.* Somewhat rare in the Channel Islands, S. and Central England, Wales and N. and W. Ireland.—*B. M.* Jerbourg, Guernsey; Noirmont, Jersey; Sark; Lamorna, Cornwall; Torquay, Devon; North Hill, Malvern, Worcestershire; Conway, Carnarvonshire; Kinsale, Cork.

Var. **meiosperma** Steiner in Verh. K. K. Zool.-Bot. Ges. Wien lvii. p. 363 (1907).—Thallus as in the type. Apothecia often bluish-grey pruinose; spores smaller, 0,009–12 mm. long, 0,005–7 mm. thick.—*Lecidea disciformis* var. *meiosperma* Nyl. in Flora li. p. 478 (1868); Cromb. Lich. Brit. p. 88. *L. subdisciformis* var. *meiosperma* Leight. Lich. Fl. p. 308 (1871); ed. 3, p. 322.

Hab. On rocks.—*Distr.* Rare in the Channel Islands.—*B. M.* Jersey; the Eperquerie, Sark.

25. **B. disciformis** Mudd Man. p. 216 (1861) pro parte.—Thallus determinate, thin, smooth, continuous, unequal or cracked-areolate, whitish or greyish-white, (K + yellow, CaCl −); hypothallus thin, black, limiting the thallus. Apothecia sessile, moderate or somewhat small, plane and thinly margined, at length convex and almost immarginate, black; hypothecium dark-brown or black; paraphyses subconcrete, brownish at the apices, branched and capitate; spores ellipsoid or oblong, 0,019–30 mm. long, 0,008–0·014 mm. thick; hymenial gelatine bluish with iodine.—*Lecidea disciformis* Nyl. in Bot. Not. 1852, p. 175; Cromb. Lich. Brit. p. 88; Leight. Lich. Fl. p. 305;

ed. 3 p. 317. *Lecidea parasema* var. *disciformis* Fr. Nov. Sched. Crit. p. 9 (1826).

Exsicc. Leight. n. 180; Mudd n. 187; Carroll Lich. Hib. n. 19; Johns. n. 388.

Often confounded by authors with *L. parasema*, from which, among other differences, the character of the spores renders it very distinct. The thallus, at times little visible, is occasionally entirely evanescent (form *ecrustacea* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 387 (1856)). The apothecia are numerous, but usually somewhat scattered. The minute black spermogones, which are not unfrequent, have slender straight spermatia 0,004–5 mm. long, 0,001 mm. thick.

Hab. On the smooth bark, very rarely on denudate trunks of trees in upland districts.—*Distr.* General and not uncommon in Great Britain, rarer in S. Ireland, not seen from the Channel Islands.—*B. M.* Sevenoaks, Kent; St. Leonards Forest, Sussex; near Lyndhurst, New Forest, Hants; Ullacombe, Bovey Tracey, S. Devon; Launceston, Cornwall; Nannau and Garth, Dolgelly, Merioneth; Bettws-y-Coed, Carnarvonshire; Llanforda and Haughmond Hill, Shropshire; Kildale and Newton Wood, Cleveland, Yorkshire; Eglestone, Durham; Windermere, Westmoreland; Barcaldine, Argyll; Kenmore, Killin, Glen Lochay, Glen Falloch and Aberfeldy, Perthshire; Barcaldine, Argyll; Banchory Devenick near Aberdeen, and Castleton of Braemar, Aberdeenshire; Lairg, Sutherlandshire; Applecross, Rossshire; Glenbower Wood and Old Deer Park, Castle Martyr, Cork; Muckross and Croghan, Killarney, Glencar and Blackwater Bridge, Old Dromore, Kerry.

Var. **saxicola** Oliv. Exp. Syst. Lich. ii. 2, p. 145 (1901).—Thallus tartareous, smooth, unequal, cracked-areolate, the areolæ contiguous, whitish or greyish; apothecia numerous, becoming convex and immarginate, sometimes 2- or 3-aggregate, somewhat scabrid; hypothecium reddish- or blackish-brown; paraphyses discrete, brown at the tips, branched and capitate; spores ellipsoid, 0,018–22 mm. long, 0,09–11 mm. thick.

Agreeing with the species in the general characters but differing in the somewhat thicker thallus, the smaller spores, and the saxicolous habitat.

Hab. On rocks.—*B. M.* Near Land's End, Cornwall.

Var. **insignis** A. L. Sm.—Thallus effuse, thin, warted-granular, whitish. Apothecia rather large; usually plane; spores large, 0,018–32 mm. long, 0,011–16 mm. thick, otherwise as in the species.—*Buellia insignis* var. *corticicola* Koerb. Syst. Lich. Germ. p. 230 (1855); Leight. in Grevillea i. p. 134 (1873). *Lecidea insignis* var. *muscorum* Næg. in Hepp Flecht. Eur. n. 40 (1853); f. *corticicola* Leight. Lich. Fl. ed. 3, p. 314; *L. disciformis* subsp. *insignis* Nyl. ex Norrl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. x. p. 340 (1873).

Differs from the species in the habitat and in the generally larger spores. Leighton (*ll. c.*) records only the f. *corticicola* (Koerb. *l. c.*)

collected at Bomere Pool, Shropshire, which perhaps belongs to the species.

Hab. Incrusting mosses on the ground in an alpine situation.—*B. M.* Summit of Ben Lawers, Perthshire.

Var. **triphragmia** Boist. Nouv. Fl. Lich. pt. 2, p. 234 (1902).—Thallus and apothecia similar to the species; spores 3-septate, 0,024–34 mm. long, 0,009–11 mm. thick.—*Lecidea triphragmia* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 387 (1856); Cromb. in Journ. Bot. ix. p. 179 (1871); Leight. Lich. Fl. p. 329; ed. 3, p. 349.

Similar to the species, but with 3-septate spores mixed with the 1-septate.

Hab. On shady rocks.—*B. M.* Morrone, Braemar, Aberdeenshire.

26. **B. lyperiza** A. L. Sm.—Thallus greyish or blackish-grey, thin, smooth, continuous, obscurely limited (K −, CaCl −). Apothecia black, plane or slightly convex, rather large, margin obtuse; hypothecium dark-brownish, grumous; paraphyses distinct, slender, often septate, branched above; spores dark-brown, ellipsoid, sometimes 3–4-nucleate, rather large, 0,016–22 mm. long, 0,009–12 mm. thick; hymenial gelatine intensely-blue with iodine.—*Lecidea lyperiza* Stirton in Grevillea iii. p. 35 (1874); Leight. Lich. Fl. ed. 3, p. 323 (1879) (sphalm. *hyperiza*). Specimen not seen.

Hab. On smooth bark of trees. Collected by Dr. Stirton near Killin, Perth.

27. **B. coniops** Th. Fr. Lich. Arct. p. 231 (1860).—Thallus determinate, warted-granulose, unequal, moderate, greyish-brown or greyish-ferruginous, the granules small, crenate, at length conglomerate (K −, CaCl −); hypothallus blackish, often limiting the thallus. Apothecia subminute, plane, adnate-appressed, black or brownish-black, margined, the margin prominent, thin, entire; hypothecium brownish; paraphyses coherent, brown at the thickened apices; spores ellipsoid, obtuse, slightly constricted in the middle, blackish-brown, 0,012–17 mm. long, 0,008–9 mm. thick; hymenial gelatine deep-blue with iodine.—*Lecidea coniops* Wahlenb. in Ach. Meth. Suppl. p. 8 (1803); Cromb. Lich. Brit. p. 88; Leight. Lich. Fl. p. 306; ed. 3, p. 318.

Often confounded by authors with *Lecidea latypea*. It at first forms small circular patches on the substratum, limited by a radiating hypothallus, which subsequently become confluent, with the hypothallus evanescent. The British specimens gathered are well fertile.

Hab. On schistose rocks in a maritime district.—*B. M.* Near Cove, Kincardineshire.

28. **B. atrata** Mudd Man. p. 215 (1861).—Thallus greyish or usually greyish-black, rather thick, cracked-areolate, the areolæ

small, smooth, plane or convex (K + yellow then red); hypothallus black. Apothecia black, innate or appressed, becoming superficial, plane or convex, the margin thin, entire, disappearing; hypothecium thick, dark-brown; paraphyses somewhat lax, dark-bluish-green or almost black at the apices; spores dark-brown, ellipsoid, 0,011–17 mm. long, 0,006–10 mm. thick; hymenial gelatine deep-blue with iodine.—*B. coracina* Koerb. Syst. Lich. Germ. p. 224 (1855); Mudd Man. p. 214. *Verrucaria coracina* Hoffm. Deutschl. Fl. ii. p. 183 (1795)? *Lichen atratus* Sm. Eng. Bot. t. 2335 (1811). *Lecidea atrata* Hook. in Sm. Eng. Fl. p. 174 (1833) (non Ach. fide Th. Fr. Lich. Scand. p. 607). *L. coracina* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 372 (1856) (non Ach. vel pro minore parte, fide Th. Fr. Lich. Scand. p. 607); Cromb. Lich. Brit. p. 86; Leight. Lich. Fl. p. 307; ed. 3, p. 321.

Easily recognized by the very dark colour of the thallus and apothecia. The specimens collected by Mudd and named by him *B. coracina* are included under *B. œthalea*. They have a lighter-coloured thallus and light-brown hypothecium.

Hab. On rocks.—*Distr.* Somewhat rare in subalpine districts of England, Scotland and Ireland.—*B. M.* Canlochan, Forfarshire; Morrone, Braemar, Aberdeenshire.

Var. **brunnea** A. L. Sm.—Thallus brownish or black, composed of small areolæ contiguous or somewhat scattered on a black, predominating, radiating hypothallus (K −, CaCl −). Apothecia black, convex, with a thin unequal margin, sometimes several aggregate; hypothecium thick, black; paraphyses easily separating from the hypothecium and brownish at the base, subdiscrete, clavate and dark-greenish-blue or almost black at the tips; spores rounded oblong, becoming dark-brown, 0,012–15 mm. long, 0,008 mm. thick; hymenial gelatine deep-blue with iodine.

Outwardly resembling *Lecidea atrobrunnea* Schær., a continental species. It differs from the species in the lighter, more dispersed thallus and in the absence of any thalline reaction.

Hab. On a granitic boulder.—*B. M.* Summit of Craig Calliach, Perthshire.

29. **B. scabrosa** Koerb. Syst. Lich. Germ. p. 227 (1855).—Thallus determinate, appressed, thin, areolate or areolate-granular, citrine or yellow-greenish (K + yellow, CaCl −); hypothallus obsolete. Apothecia small, appressed, somewhat convex, at length immarginate, black, slightly scabrid, hypothecium black; paraphyses slender, conglutinate, dull-greenish in the mass, the epithecium black; spores ellipsoid, brown, 0,012–18 mm. long, 0,006–8 mm. thick; hymenial gelatine tawny-wine-red with iodine.—*Lecidea scabrosa* Ach. Meth. p. 48 (1803); S. F. Gray Nat. Arr. i. p. 466 pro parte; Hook. in Sm. Engl. Fl. v.

p. 178; Tayl. in Mackay Fl. Hib. ii. p. 122; Cromb. Lich. Brit. p. 93; Leight. Lich. Fl. p. 304; ed. 3, p. 316.

Exsicc. Larb. Lich. Hb. n. 146.

Has much the general aspect of more developed states of *Bacidia flavovirescens*, of which it was subsequently regarded by Acharius as a variety. Apart, however, from other characters, it differs in the anatomical structure of the apothecia. In the British specimens the thallus usually forms small orbicular patches. The apothecia are numerous, often aggregate and confluent, arranged as it were in circles.

Hab. On the ground, rarely encrusting mosses on rocks in mountainous districts, generally associated with *Bœomyces rufus*.—*Distr.* Very local and scarce on the Grampians, Scotland, and in W. Ireland. —*B. M.* Ben Lawers, Craig Tulloch, and Rannoch, Perthshire; Canlochan, Forfarshire; Morrone, Braemar, Aberdeenshire; near Kylemore, Connemara, Galway.

Form **athallina** A. L. Sm.—Thallus absent; apothecia parasitic; otherwise as in the type.—*Lecidea scabrosa* f. *athallina* Nyl. ex Norrl. in Not. Sällsk. Faun. & Fl. Fenn. n. ser. x. p. 341 (1873).

In one of the two British specimens there are traces of the proper thallus, which probably is always normally present, though obliterated, as in other instances, by the more vigorous growth of the host.

Hab. On the thallus of *Bœomyces rufus* in mountainous regions. —*Distr.* Rare on the Grampians, Scotland.—*B. M.* Ben Lawers, Perthshire; Braemar, Aberdeenshire.

30. **B. alpicola** Krempelh. Lich.-Fl. Bay. p. 200 (1861).—Thallus subdeterminate, thickish, areolate, the areolæ rather large, continuous or somewhat scattered, plane or slightly convex, bright-yellow (K + deep yellow, at length orange-red, CaCl −, medulla I −); hypothallus black, distinct. Apothecia black, appressed, plane and thinly margined, at length often slightly convex, sessile, and immarginate; hypothecium brownish-black; paraphyses concrete, black at the apices, spores ellipsoid, greenish-black, 0,018–28 mm. long, 0,010–15 mm. thick; hymenial gelatine deep-blue with iodine. — *Lecidea alpicola* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 388 (1856); Cromb. in Journ. Bot. viii. p. 99 (1870) & in Grevillea iii. p. 143; Leight. Lich. Fl. p. 315; ed. 3, p. 328. *L. geographica* var. *alpicola* Schær. Spicil. p. 124 (1828) & Enum. p. 106. *L. atro-virens* var. *alpicola* Wahlenb. Fl. Lapp. p. 474 (1812) pro parte.

Externally subsimilar to states of *Rhizocarpon geographicum*, with which, at first sight, it might readily be confounded. It differs, in the rather larger areolæ and apothecia, and more especially in the 1-septate shorter spores and the thalline reaction with hydrate of potash. Apparently one of our rarer British lichens.

Hab. On quartzose and whinstone rocks and boulders in alpine

situations.—*Distr.* Very local and scarce on summits of a few of the Grampians, Scotland.—*B. M.* Mael Graedha, Killin, Perthshire; Morrone, Braemar, Aberdeenshire; Ben Nevis, Invernessshire.

31. **B. pulchella** Tuckerm. Gen. Lich. p. 185 (1872).—Thallus orbicular, thick, wrinkled, roundly lobed at the circumference, citrine-sulphureous or bright-greenish-yellow (K−, CaCl−, medulla I−); hypothallus black. Apothecia moderate, appressed, plane, obtusely margined, at length sessile, convex, immarginate, black, concolorous within; hypothecium thick, black; paraphyses coherent, yellowish-brown or sordid-greenish, dark-brown at the apices; spores ellipsoid, obtuse at the apices, often slightly constricted in the middle, brown, 0,010–17 mm. long, 0,007–0,010 mm. thick; hymenial gelatine bluish with iodine.—*Lichen pulchellus* Schrad. in Schrad. Journ. Bot. i. 74 (1801). *L. galbulus* Ramond ex DC. Fl. Fr. ii. p. 368 (1805). *Lecidea pulchella* Schær. Enum. p. 100 (1850); Leight. Lich. Fl. ed. 3, p. 544. *L. galbula* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 388 (1856); Cromb. Lich. Brit. p. 93.

Well characterized not only by the form of the thallus, but also by its colour, which readily attracts the eye. In age, according to Th. Fries (Lich. Scand. p. 588), the thallus becomes pulverulent or rimulose. The apothecia are here and there confluent.

Hab. Incrusting decayed mosses on the ground in crevices of boulders in alpine localities.—*Distr.* Extremely local and scarce on one of the N.W. Grampians, Scotland.

32. **B. colludens** Tuckerm. Syn. N. Amer. Lich. pt. 2, p. 100 (1888).—Thallus effuse or subdeterminate, areolate, the areolæ plane or somewhat convex, scattered or contiguous, greyish-red or brownish-grey, sometimes almost obsolete (K−, CaCl−, I−); hypothallus black. Apothecia rather large, sessile or innate-sessile, plane, black, the margin thickish, entire, or rarely crenulate; hypothecium brownish-black; paraphyses conglutinate, brownish-black at the clavate apices; spores at first colourless then brown, ellipsoid or somewhat fusiform, with a hyaline epispore, 0,018–29 mm. long, 0,007–14 mm. thick; hymenial gelatine deep-blue with iodine.—*Lecidea colludens* Nyl. in Flora liii. p. 38 (1870); Cromb. in Journ. Bot. viii. p. 99 (1870); Leight. Lich. Fl. p. 314. *L. atroalba* var. *applanata* Fr. Summa, p. 116 (1846). *L. applanata* Leight. Lich. Fl. ed. 3, p. 327 (1879) (non Chev.).

Exsicc. Larb. Lich. Hb. n. 355; Johns. n. 391.

The thallus varies in thickness and colour, and is sometimes limited by the hypothallus. The apothecia are numerous, scattered or contiguous, and sometimes slightly umbonate, with the margin usually persistent, though occasionally they are convex and immarginate.

Hab. On schistose and quartzose rocks, usually by streams in upland and subalpine districts.—*Distr.* Rather local in Central

England, Wales, on the Grampians, Scotland, and in W. Ireland.—*B. M.* Bradgate Park, Leicestershire; near Buxton, Derbyshire; Dolgelly and Cader Idris, Merioneth; near Douglas, Isle of Man; Eskdale, Cumberland; Ben Lawers and Craig Calliarch, Perthshire; Morrone, Braemar, Aberdeenshire; Glen Nevis, Invernessshire; near Kylemore, Connemara, Galway.

33. **B. deludens** A. L. Sm.—Thallus determinate thin, firm, cracked, whitish (Kf + yellowish, CaCl−); hypothallus thin, black. Apothecia rather large, plane, innate and circumcised, obtusely margined, black; hypothecium brown; paraphyses subdiscrete, regular, brown or violet-brown at the clavate apices, the epithecium blackish (K + purplish); spores ellipsoid, dark-brown, with a hyaline epispore, 0,022–27 mm. long, 0,008–13 mm. thick; hymenial gelatine deep-blue with iodine.—*Lecidea deludens* Nyl. in Flora lvi. p. 296 (1873); Cromb. in Grevillea ii. p. 90; Leight. Lich. Fl. ed. 3, p. 323.

The apothecia usually scattered, are occasionally 2–3-confluent, the margin then being obliterated.

Hab. On quartzose stones in an alpine situation.—*B. M.* Summit of Cairn Gowar, Blair Athole, Perthshire (the only locality).

34. **B. confervoides** Krempelh. Lich.-Fl. Bay. p. 200 (1861).—Thallus effuse, greyish- or brownish-white, thin, tartareous, areolate, the areolæ small, contiguous or scattered, plane or slightly convex, hypothallus blackish, usually indistinct. Apothecia small, black, innate sessile, plane, indistinctly marginate; hypothecium blackish-brown; paraphyses slender, conglutinate, slightly clavate, and blackish-brown at the apices; spores ellipsoid, at first colourless, becoming brown, with a hyaline epispore, 0,021–30 mm. long, 0,008–14 mm. thick.—*Lecidea atroalbicans* Nyl. in Flora lviii. p. 363 (1875); Leight. Lich. Fl. ed. 3, p. 328.

Distinguished by the smooth thallus and the innate flat apothecia.

Hab. On rocks.—*Distr.* Rare in W. Scotland and W. Ireland.—*B. M.* Barcaldine, Argyll; Cloghan, Connemara, Galway.

35. **B. badioatra** Koerb. Syst. Lich. Germ. p. 223 (1855).—Thallus determinate, thickish, areolate or cracked-areolate, the areolæ plane, brownish or dark-brown (K−, CaCl−, K, CaCl+ tawny-yellow, medulla I−); hypothallus blackish. Apothecia, innate, plane, thinly margined, black; hypothecium dark-brown; paraphyses coherent or lax, purplish or reddish-brown at the slightly clavate apices; epithecium blackish (K+ purplish violet); spores ellipsoid or oblong-ellipsoid, often slightly constricted in the middle, brown or at length blackish-brown, with a thin hyaline epispore, 0,026–36 mm. long, 0,012–18 mm. thick; hymenial gelatine deep-blue with iodine.—Mudd Man. p. 214, t. 4, f. 81, pro parte. *Lecidea badioatra* Floerke ex Spreng.

Neu. Entdeck. ii. p. 95 (1821); Schær. Enum p. 111; Cromb. Lich. Brit. p. 86; Leight. Lich. Fl. p. 306; ed. 3, p. 318.

Hab. On alpine schistose rocks.—*Distr.* Rare on the Grampians, Scotland, and S.W. Ireland.—*B. M.* Loch-na-gat, Ben Lawers, Perthshire; Killarney, Kerry.

Var. **atrobadia** A. L. Sm.—Differs from the species in the more scattered thallus and in the more marked radiating hypothallus. Apothecia larger, convex, the epithecium dark-violet-brown (K+purplish); spores oblong, brown, 0,021–30 mm. long, 0,010–14 mm. thick.—*Lecidea atrobadia* Nyl. in Flora lv. p. 361 (1872); Cromb. in Grevillea i. p. 62; Leight. Lich. Fl. ed. 3, p. 318.

Hab. On a quartzose boulder in an alpine situation.—*B. M.* Summits of Ben-y-gloe, Blair Athole, Perthshire (the only locality).

36. **B. atroalba** Th. Fr. Lich. Arct. p. 230 (1860), pro parte.—Thallus greenish or brownish, tartareous, determinate, cracked-areolate, the areolæ plane or convex. Apothecia black or brownish-black, appressed plane or slightly convex, the margin thin or disappearing, hypothecum brownish-black; paraphyses subdiscrete, rather stout, slightly clavate and blackish at the tips; spores oblong or oblong-elliptical, slightly constricted at the septum, brownish, large, with a hyaline epispore, 0,025–36 mm. long, 0,012–17 mm. thick.—*Lichen atroalbus* L. Sp. Pl. p. 1141 (1753)?; Lightf. Fl. Scot. ii. p. 804 (1777)? (non With. Arr. ed. 3, iv. p. 5 (1796), which is *Lecidea aglæa* pro parte, fide Cromb. in Grevillea xii. p. 57 (1883)); Ach. Prodr. Lich. Suec. p. 63 (1798); Engl. Bot. t. 2336? *Lecidea atroalba* Ach. Meth. p. 45 (1803); Hook. Fl. Scot. ii. p. 36 & in Sm. Engl. Fl. v. p. 174 pro parte; Tayl. in Mackay Fl. Hib. ii. p. 116 pro parte; Cromb. Lich. Brit. p. 86; Leight. Lich. Fl. p. 305; ed. 3, p. 317.
Exsicc. Leight. n. 186.

Differs from the preceding in the thinner, lighter coloured thallus and in the colour of the epithecium, which does not show any reaction with potash.

Hab. On maritime and alpine rocks.—*Distr.* Rare in S. England, Wales, E. Scotland and Ireland.—*B. M.* Torquay, Devon; Llandyssil, Cardiganshire; Cove and Portlethen, Kincardineshire; Cape Clear Island and near Cork.

37. **B. Parmeliarum** Oliv. Exp. Syst. Lich. ii. p. 393 (1903).—Thallus none. Apothecia minute, subinnate-sessile, convex, immarginate, black, naked or greenish-pruinose; hypothecium brown; paraphyses concrete; spores ovoid-oblong, brown, 0,017–21 mm. long, 0,007–8 mm. thick; hymenial gelatine not tinged with iodine.—*Lecidea Parmeliarum* Sommerf. Suppl. Fl. Lapp. p. 176 (1826); Cromb. Lich. Brit. p. 92; Leight. Lich. Fl. p. 357; ed. 3, p. 386. *Abrothallus Smithii* Tul. in Ann. Sc. Nat.

sér. 3, xvii. p. 113 (1852); Lindsay in Journ. Micr. Sci. v. p. 34, t. 4, figs. 1–14 (1857); Mudd Man. p. 224, t. 4, f. 86. *Lichen parasiticus* Sm. Engl. Bot. t. 1866 (1808).

Brit. Exs. Leight. nos. 191, 309, 310; Mudd n. 201.

Included by some authors among the fungi owing to the absence of a proper thallus; it usually deforms the lobes of the host, e.g. *Parmelia saxatilis* and *P. omphalodes*, whence these were supposed by Sommerfelt to be its proper thallus. The erumpent apothecia are at length subglobose. Intermixed with these, immersed pycnidia are of common occurrence on the alien thallus.

Hab. On the thalli of various foliaceous lichens—*Parmelia saxatilis* and var. *furfuracea*, *P. omphalodes*, *P. tiliacea*, *P. exasperata*, *Stictina fuliginosa*, *Platysma glaucum*, etc., in maritime, upland and subalpine districts.—*Distr.* General and not uncommon in Great Britain, apparently rarer in Ireland, rare in the Channel Islands.—*B. M.* Jerbourg, Island of Guernsey; Withiel, Cornwall; Torquay, Hay Tor and near the Bottor Rock, Dartmoor, S. Devon; Eridge, Sussex; Essex; North Hill, Malvern, Worcestershire; Charnwood Forest, Leicestershire; Llyn Geironydd, Abergavenny, Monmouthshire; Aran Mawddwy, Cader Idris and Dolgelly, Merioneth; Ingleby Park, Cleveland, Yorkshire; High Force, Teesdale, Durham; Barcaldine and Inverary, Argyll; Glen Lochay, Killin, Craigie Hill, Perth, Craig-y-Barns, Dunkeld and Glen Shee, Perthshire; Canlochan, Forfarshire; Durris, Kincardineshire; Countesswells, near Aberdeen; Glen Callater, Braemar, Aberdeenshire; Glen Nevis, Invernessshire; Blarney, Cork; Mangerton, Killarney, Kerry; near Dawros, Connemara, Galway.

38. **B. particularis** A. L. Sm.—Thallus absent. Apothecia small, plane, margined, black; paraphyses slender, not very well discrete; hymenium in thin section yellowish (K + somewhat purplish); hypothecium and perithecium blackish; spores ellipsoid, brownish-black, 0,008–0,010 mm. long, 0,0035–45 mm. thick; hymenial gelatine deep-blue with iodine.—*Lecidea particularis* Nyl. in Flora lx. p. 461 (1877); Cromb. in Grevillea vi. p. 113; Leight. Lich. Fl. ed. 3, p. 386.

Exsicc. Larb. Lich. Hb. without number.

Well characterized by the structure of the apothecia and by the host upon which it occurs. The single specimen seen is fragmentary and only sparingly fertile.

Hab. On the thallus of *Bæomyces rufus* (saxicolous).—*B. M.* Near Kylemore, Connemara, Galway.

39. **B. advenula** A. L. Sm.—Thallus absent. Apothecia parasitic, minute, plane or slightly convex, rugulose, submarginate, blackish; paraphyses concrete; epithecium purplish-black; hypothecium brownish-black (K + yellowish); spores 4 in the ascus, obtusely ellipsoid, blackish, 0,019–0,023 mm. long, 0,0014–16 mm. thick; hymenial gelatine deep-blue with iodine. —*Lecidea advenula* Leight. in Trans. Linn. Soc. ser. 2, i. p. 146,

t. 22, figs. 17–20 (1876) & Lich. Fl. ed. 3, p. 388; Cromb. in Journ. Bot. lviii. p. 141 (1875).

Exsicc. Larb. Lich. Hb. n. 38.

Allied to *Lecidea epispila* Nyl. (Lich. Pyr. Or. p. 65), which occurs on the same *Pertusaria* in E. Pyrenees, differing, however, in being athalline and smaller, in the darker epithecium and hypothecium, as also in the number of the rather thicker spores. The apothecia are usually somewhat scattered.

Hab. On the thallus of *Pertusaria Wulfenii* var. *rupicola* in mountainous districts. *Distr.* Only a few localities in N. Wales, the S. Grampians, Scotland and W. Ireland.—*B. M.* Llanbedrog, near Pwllheli, Merioneth; The Trossachs, Perthshire; Achosragan Hill, Appin, Argyll; near Kylemore and Lettermore, Connemara.

77. **LECIOGRAPHA** Massal. Gen. Lich. p. 14 (1854). *Dactylospora* Koerb. Syst. Lich. Germ. p. 271 (1855); Mudd Man. p. 223. (Pl. 14.)

Thallus none. Apothecia parasitic on the thallus of other lichens, immersed then superficial, discoid black and carbonaceous; hypothecium dark-coloured; spores 8 in the ascus, oblong-ellipsoid or oblong-fusiform, 3-septate, brown.

1. **L. parasitica** Massal. *l. c.* & Symm. Lich. p. 66 (1855).—Apothecia small, sessile, at first somewhat concave, then plane, margined, black, the margin thin, entire, prominent, slightly shining; hypothecium dark-reddish-brown; paraphyses conglutinate, thicker and reddish-brown at the tips; spores oblong-cylindrical, 3-septate, brown, 0,009–15 mm. long, 0,0035–45 mm. thick; hymenial gelatine deep-blue with iodine.—*Lecidea parasitica* Floerke Deutsch. Lich. 6, p. 3 (1819); Cromb. Lich. Brit. p. 94; Leight. Lich. Fl. p. 357; ed. 3, p. 387. *L. inspersa* Tul. in Ann. Sci. Nat. sér. 3, xvii. p. 118 (1852). *L. Zwackhii* Cromb. in Journ. Bot. xiv. p. 362 (1876)? *Dactylospora inspersa* Mudd Man. p. 224, t. 4, fig. 85 (1861).

Exsicc. Leight. n. 183; Larb. Lich. Cæsar. n. 86.

When corticolous not to be confounded with *Trachylia stigonella*, to which it bears considerable resemblance in its habit and external appearance, but from which it is separated by the spores. The apothecia are either scattered or often aggregate.

Hab. On the thallus of *Lecanora parella* and *Pertusaria communis* in maritime and upland situations.—*Distr.* General and not uncommon in England; apparently rare in the Channel Islands, Wales and S. Ireland; not seen from Scotland.—*B. M.* La Moye, Island of Jersey; Fairlight, Hastings, Sussex; near Lyndhurst, New Forest, Hants; Totnes, Lydford, and near Newton Bushell, Devon; Tilgate, Sussex; Chedworth Woods, Gloucestershire; near Twycross, Leicestershire; Hale End and near the Ragged Stone, Malvern, Worcestershire; Harboro' Magna, Warwickshire; Barmouth and near Nannau, Dolgelly, Merioneth; Aber, Carnarvonshire; Cliffrigg, Cleveland, Yorkshire; Brown's Demesne, Riverstown, Cork; Muckross, Killarney, Kerry.

Var. **parellaria** A. L. Sm.—Paraphyses usually darker at the tips; spores remaining longer 1-septate, sometimes also 2- or 3-septate.—*Lecidea parellaria* Nyl. in Flora lix. p. 239 (1876); Cromb. in Journ. Bot. xiv. p. 362 (1876); Leight. in Trans. Linn. Soc. ser. 2, i. p. 238, t. 32, figs. 11 & 12 (1878) & Lich. Fl. ed. 3, p. 387.

Exsicc. Larb. Lich. Hb. n. 189.

Hab. On the thallus of *Lecanora parella*.—*Distr.* Rare in S. England, Wales and W. Ireland.—*B. M.* Fairlight, Hastings, Sussex; near Fishguard, Pembrokeshire; Diganwy near Conway, Carnarvonshire; Doughruagh Mt., Connemara.

2. **L. glaucomaria** A. L. Sm.—Apothecia growing on a small pale or brown deformed patch of the host-thallus, small, brownish-black, clustered, sessile, plane with a thickish, paler, often subflexuose margin; hypothecium blackish-brown, thin, the hymenium brownish; paraphyses indistinct, coherent, thickened and black at the apices; spores oblong-ovoid, 3-septate, becoming brownish, 0,021–25 mm. long, 0,008–9 mm. thick; hymenial gelatine pale-blue then wine-red with iodine.—*Lecidea glaucomaria* Nyl. in. Bot. Not. 1852, p. 177, fig. 10 & 1853, p. 99; Carroll in Journ. Bot. iii. p. 291 (1865); Leight. in Trans. Linn. Soc. ser. 2, i. p. 238, t. 32, figs. 9 & 10 (1878) & Lich. Fl. ed. 3, p. 389. Specimen not seen.

Carroll (*l. c.*) quotes as a synonym of this species, *Schismatomma amylaceum* var. *candidum* Mudd, a variety founded on *Lichen candidus* Sm. (Engl. Bot. t. 1138), which was considered by Leighton as synonymous with his *Lecidea Turneri*, and has been already described as *Bilimbia candida* (p. 137).

Hab. Parasitic on the thallus of *Lecanora glaucoma*, not to be confounded with *Arthonia glaucomaria*, which grows on the apothecia of the same lichen.—*Distr.* Rare in S.W. Wales (Goodwick Bay, Pembrokeshire).

3. **L. plumbina** Anzi Comm. Critt. Ital. i. p. 158 (1861).—Apothecia small, black, sessile, solitary or aggregate, plane with a thin margin, then convex and immarginate; hypothecium brown; paraphyses conglutinate; spores narrowly fusiform, 3-septate, brownish, 0,022 mm. long, 0,003 mm. thick.

The only specimen in the British Museum, collected by Rev. W. Johnson, and marked *Lecidea plumbina*, has somewhat large spores, 0·020–35 mm. long, 0·003–4 mm. thick, the paraphyses are stout, clavate, globose, and bluish-black at the tips.

Hab. On the thallus of *Coccocarpia plumbea*.—*B. M.* Borrowdale, near Keswick, Cumberland.

4. **L. scapanaria** A. L. Sm.—Thallus whitish, effuse, minutely granular-areolate. Apothecia black, appressed, plane or slightly convex, marginate, blackish within; hypothecium brownish-black; spores oblong or ellipsoid-fusiform, brown, 3-septate, 0,019–23

mm. long, 0,008 mm. thick; hymenial gelatine deep-blue with iodine.—*Lecidea scapanaria* Carrington in Trans. Bot. Soc. Edin. vii. pp. 382 & 411, t. 10, fig. 4 (1863); Cromb. Lich. Brit. p. 87; Leight. Lich. Fl. p. 358; ed. 3, p. 387. *L. persimilis* Nyl. in Sällsk. Faun. & Fl. Fenn. n. ser. i. p. 237 (1859)? Stirton in Grevillea ii. p. 71 (1873); Leight. Lich. Fl. ed. 3, p. 391?

A doubtful lichen; the alteration in form of the hepatic noted by Carrington rather indicates a fungoid parasite. Further examination with fresh material is desirable.

Hab. On hepatics. Rare in S. and W. Ireland and (*fide* Stirton) in Central and E. Scotland.—*B. M.* Killarney, Kerry; Doughraugh Mt., Connemara, Galway.

78. **RHIZOCARPON** Ramond in DC. Fl. Fr. ii. p. 365 (1805). *Diplotomma* Flot. in Bot. Zeit. viii. p. 381 (1850) pro parte; Mudd Man. p. 218. (Pl. 15.)

Thallus crustaceous, usually with a distinct, dark-coloured hypothallus, or hypothallus sometimes wanting (*Diplotomma*). Algal cells *Protococcus*. Apothecia usually dark-coloured and carbonaceous, immarginate or with a proper margin only; asci 8- or fewer-spored; spores ellipsoid or oblong, mostly rather large, septate and muriform, colourless or brown, usually with a hyaline, mucilaginous epispore (halonate).

The genus *Diplotomma*, as understood by Mudd, included those species in which the hypothallus was but little developed and the apothecia surrounded by the thallus to form a spurious margin.

1. **Rh. perlutum** A. Zahlbr. in Engl. & Prantl. Pflanzenf. i. 1*, p. 138 (1905).—Thallus subdeterminate, thin, continuous, rimose, glaucous-white or glaucous-ochraceous (K−, CaCl−). Apothecia somewhat large, plane, margined, rusty-red or rusty-brown, within subconcolorous, not carbonaceous, the margin usually paler; paraphyses slender, coherent; epithecium and perithecium yellow-reddish in thin section; hypothecium dark-red in the middle; spores ellipsoid-oblong, muriform, colourless, 0,030–42 mm. long, 0,013–16 mm. thick; hymenial gelatine bluish, the asci tawny-wine-coloured with iodine.—*Lecidea perluta* Nyl. in Flora lix. p. 575 (1876); Cromb. in Grevillea v. p. 106; Leight. Lich. Fl. ed. 3, p. 380.

Has much the aspect of *Rh. ochrotropa*, a plant of Finland and Madeira, but the apothecia are more brightly coloured; they are scattered and occasionally approximate.

Hab. On moist quartzose rocks in an upland mountainous situation.—*B. M.* Erriff River, Connemara, Galway.

2. **Rh. Œderi** Koerb. Parerg. Lich. p. 232 (1861).—Thallus effuse, thinnish, minutely granular, areolate, yellowish-ferruginous (K −, CaCl −, medulla I + bluish). Apothecia small,

black, almost plane, umbonate or usually somewhat plicate or wrinkled, the margin thin, flexuose; hypothecium black; paraphyses slender, bluish-green or dark-brown towards the tips; spores oblong, colourless or rarely brownish, 3-septate, slight, constricted at the septa, sometimes halonate, 0,018–24 mm. long, 0,008–11 mm. thick; hymenial gelatine bluish with iodine. —*Rh. petræum* var. *Œderi* Mudd Man. p. 220 (1861). *Lichen Œderi* Web. Spicil. Fl. Goett. p. 182 (1778) (non Engl. Bot.). *Lecidea Œderi* Ach. Meth. p. 49 (1803); Leight. Lich. Fl. p. 329; ed. 3, p. 349. *L. petræa* subsp. *Œderi* Cromb. Lich. Brit. p. 87.

Exsicc. Leight. n. 187; Larb. Lich. Hb. n. 179.

Often confused with *Lecanora Dicksonii* (see Part I. p. 476) on account of the rusty-red colour of the thallus.

Hab. On maritime and mountainous rocks.—*Distr.* Not uncommon throughout Great Britain and Ireland; not recorded from the Channel Islands.—*B. M.* Near Launceston, Cornwall; Barmouth and Dolgelly, Merioneth; Trefriw, Carnarvonshire; Lounsdale, Cleveland, Yorkshire; King's Park, near Edinburgh; Nigg, Kincardineshire; Ben Vrackie and Ben Lawers, Perthshire; Appin, Argyll; Glen Callater, Glen Ey and Castleton, Braemar, Aberdeenshire; Glen Nevis, Invernessshire; Ballinakiel, Connemara, Galway.

3. **Rh. alboatrum** Th. Fr. Lich. Arct. p. 237 (1860).—Thallus effuse, whitish or greyish, somewhat areolate or granular or almost disappearing (K−, CaCl−); hypothallus wanting. Apothecia small, black, sometimes whitish-pruinose, adnate, convex, sometimes with a spurious white margin; hypothecium dark-brown; paraphyses slender, capitate and dark-brown at the tips; spores ellipsoid, brown, 1- or 3-septate or irregularly muriform, not halonate, 0,016–20 mm. long, 0,007–9 mm. thick; hymenial gelatine deep-blue with iodine.—*Lichen alboater* Hoffm. Enum. Lich. p. 30 (1784). *L. corticola* Ach. in Vet. Acad. Handl. 1795, p. 137, t. 5, f. 6; Dicks. Pl. Crypt. iv. p. 20 (1801); Engl. Bot. t. 1892. *Lecidea corticola* Ach. Meth. p. 53 (1803); S. F. Gray Nat. Arr. i. p. 469 (1821) pro parte. *Patellaria leucoplaca* DC. Fl. Franc. v. p. 347 (1805)? *L. alboatra* Fr. Lich. Eur. p. 336 (1831); Hook. in Sm. Engl. Fl. v. p. 180; Cromb. Lich. Brit. p. 87 (incl. var. *leucoplaca*); Leight. Lich. Fl. p. 326 (incl. f. *leucoplaca*); ed. 3, p. 346 (incl. f. *populorum*). *Diplotomma alboatrum* Flot. ex Massal. Ric. Lich. p 98 (1852); Mudd Man. p. 218, t. 4, f. 82 (incl. vars. *trabellinum* and *populorum*).

Exsicc. Leight. n. 64; Mudd nos. 188 (as *Buellia disciformis* var. *rugulosa*), 191, 192 (var. *populorum*); Larb. Lich. Hb. n. 176; Johns. n. 396.

A number of forms have been distinguished according to differences noted in the appearance of the thallus or apothecia. Var. *trabinella* (*Lecidea alboatra* var. *trabinella* Fr. *l. c.*) represents a somewhat warted form of thallus with the apothecia, crowded, often confluent

and immarginate. In var. *populorum* (*Diplotomma populorum* Massal. Ric. Lich. p. 99 (1852); *Lecidea parasema* var. *athroa* Ach. Meth. p. 36) the thallus is limited and forms whitish patches on the trunks of poplars and other trees, occasionally also on rocks.

Hab. On trees and palings.—*Distr.* General and common in England and the Channel Islands. Apparently rare in Scotland, not unfrequent in Ireland.—*B. M.* Shanklin, I. of Wight; Bovey Tracey, Devon; near Lymington, Hants; Ightham, Kent; St. Leonard's Forest, and Elmer, Middleton, Sussex; Braxted Park, Langford and Quendon, Essex; near Cheltenham and Sapperton, near Cirencester, Gloucestershire; Windsor Great Park, Berks; Nannau, Dolgelly, Merioneth; Twycross, Leicestershire; Montford Bridge near Shrewsbury, Oswestry; Wafield, Shropshire; near Alfrock Churchhill, Kempsey and Spelchley, Worcestershire; Tetsworth, Oxfordshire; Seething, Norfolk; Ettersgill, Teesdale, Durham; Sowerdale, Cleveland, Easby and Ayton and near Masham, Yorkshire; Airds House Appin, Argyll; Finlarig, Killin, Perthshire; Limerick, Clare.

Var. **venustum** A. L. Sm.—Thallus thickish, white. Apothecia somewhat larger, immersed, then emerging and subconvex, with a spurious white margin.—*Diplotomma venustum* Koerb. Parerg. Lich. p. 179 (1860). *Lecidea calcarea* Leight. Lich. Fl. p. 327; ed. 3, p. 348 (non *Lichen calcarius* Weis).

Hab. On rocks.—*Distr.* Rare in the Channel Islands, S. England, Scotland ? and W. Ireland.—*B. M.* Green Island, Jersey; near Penzance, Cornwall; Killree, Clare.

Var. **epipolia** A. L. Sm.—Thallus white, effuse or limited, tartareous, cracked-areolate or subpulverulent. Apothecia black, white- or bluish-grey-pruinose, immersed, then erumpent, at first plane, becoming convex, with or without a proper margin, often with a spurious thalline margin.—*Lichen epipolius* Ach. Lich. Suec. Prodr. p. 58 (1798); Engl. Bot. t. 1137. *Lecidea epipolia* Ach. Meth. p. 53 (1803); S. F. Gray Nat. Arr. i. p. 468. *L. alboatra* var. *epipolia* Schær. Enum. p. 122 (1850); Cromb. Lich. Brit. p. 87; f. *epipolia* Leight. Lich. Fl. p. 327; ed. 3, p. 347. *Diplotomma alboatrum* var. *epipolium* Mudd Man. p. 218 (1861).

Exsicc. Leight. n. 241; Mudd n. 193; Larb. Lich. Hb. nos. 177, 178 (as var. *ambigua*); Carroll Lich. Hib. n. 21; Johns. n. 357.

Often with the appearance of a *Lecanora* owing to the immersed apothecia being closely surrounded by the thallus. A number of forms have been recorded by Leighton and others characterized by various states of the apothecia and of thalline development;—f. *margaritacea* Leight. *l. c.* (*Lecidea margaritacea* Ach. Lich. Univ. p. 185 (1810) pro parte; S. F. Gray Nat. Arr. i. p. 468), the apothecia are more deeply immersed, with a somewhat more pronounced thalline margin; in f. *murorum* Leight. *l. c.* p. 348, the apothecia are minute and also deeply immersed, the thallus thin and pale-yellowish; f. *ambigua* Leight. *l. c.* (*Lecidea ambigua* Ach. Lich. Univ. p. 161) has a thin cracked sometimes dispersed greyish thallus, the apothecia becoming superficial and with a proper margin only.

Hab. On rocks and stones.—*Distr.* General and common in the Channel Islands and England and Wales. Somewhat rare in Ireland, rare in Scotland.—*B. M.* Green Island, Jersey; near Lewes, Newhaven and Downs, Sussex; Newlyn Cliff, Cornwall; Shanklin, I. of Wight; near Cirencester and Selsby Hill, Gloucestershire; Walthamstow, Little Baddon and Wickham Bishops, Essex; Twycross, Leicestershire; near Tenby, Pembrokeshire; Llangollen, Denbighshire; Malvern, Worcestershire; near Yarmouth and Market Dereham, Norfolk; Cherry Hinton Church, Cambridgeshire; Pinching Thorpe Wood and near Ayton, Cleveland, Yorkshire; Hartside Fell, Cumberland; Ben Lawers, Perthshire; near Cork; Ross, Clare; Killery Bay, Lettermore and Doughruagh Mt., Connemara, Galway.

4. **Rh. chlorophæum** A. L. Sm.—Thallus yellowish-white, warted or cracked-areolate, unequal, scattered or subdeterminate (K + yellow, then red). Apothecia small, subinnate-sessile, black, slightly pruinose, plane or convex; hypothecium dark-brown; paraphyses rather stout, discrete, thickened and brown at the tips; spores dark-brown, oblong, 3-septate and irregularly muriform, brown, without an epispore, 0,015–20 mm. long, 0,010–12 mm. thick; hymenial gelatine blue with iodine.—*Lecidea chlorophæa* Hepp. ex Leight. Lich. Fl. p. 328 (1871); ed. 3, p. 348.

Closely allied to f. *epipolia* of the preceding species, but differing in the more constantly muriform spores and in the thalline reaction.

Hab. On rocks and flints.—*Distr.* Rare in S. England and S. Wales.—*B. M.* S. England; Tenby, Pembrokeshire.

5. **Rh. soreumidium** A. L. Sm.—Thallus pale or pallid-greyish, thickish, wrinkled or warted-congested, limited (K −, CaCl −). Apothecia crowded, sessile, small at first, plane, wrinkled, margined and bluish-grey-pruinose, becoming convex and immarginate and often connate; hypothecium dark-brown or brownish; paraphyses indistinct, somewhat irregular, dark-brown at the tips and granular-inspersed; spores ellipsoid, 3-septate and generally muriform, brown, 0,013–20 mm. long, 0,008–10 mm. thick; hymenial gelatine deep-blue with iodine.—*Lecidea soreumidia* Stirton in Scott. Nat. iv. p. 29 (1877); Leight. Lich. Fl. ed. 3, p. 375. Specimen not seen.

Perhaps only a form of *Rh. alboatrum*.

Hab. On dead wood.—*Distr.* Alpine districts in Scotland (Ben Brecht, Argyll).

6. **Rh. geographicum** DC. Fl. Fr. ii. p. 365 (1805).—Thallus citrine or bright-greenish-yellow, determinate, thickish or rather thin, areolate, the areolæ smooth, plane, contiguous or subcontiguous (K −, CaCl −, medulla I + bluish); hypothallus black. Apothecia small or moderate in size, innate, plane or somewhat convex, marginate, black; hypothecium blackish; paraphyses conglutinate, variously dark-coloured at the apices;

spores broadly fusiform-oblong, very dark-coloured, sometimes halonate, 3-septate, frequently with longitudinal or oblique septa, 0,024–40 mm. long, 0,011–18 mm. thick; hymenial gelatine deep-blue with iodine.—Mudd Man. p. 221, t. 4, fig. 83 pro parte. *Lichenoides nigro-flavum, tabulæ geographicæ instar pictum* Dill. Hist. Musc. p. 126, t. 18, f. 5 (1740). *Lichen geographicus* L. Sp. Pl p. 1607 (1753); Huds. Fl. Angl. p. 442; Lightf. Fl. Scot. ii. p. 801; Engl. Bot. t. 245; With. Arr. ed. 3, iv. p. 12 (1796). *Lecidea geographica* Schær. Spicil. p. 124 (1823) & Enum. p. 105, t. 5, f. 3; Hook. in Sm. Engl. Fl. v. p. 178 pro parte; Tayl. in Mackay Fl. Hib. ii. p. 121; Cromb. Lich. Brit. p. 93; Leight. Lich. Fl. p. 346; ed. 3, p. 372 pro parte. *L. atrovirens* var. *geographica* Hook. Fl. Scot. ii. p. 37 (1821); S. F. Gray Nat. Arr. i. p. 465.

Exsicc. Leight. nos. 128, 129, 306; Mudd n. 196; Larb. Lich. Hb. n. 352 (f. *contigua*).

A variable plant both as to thallus and apothecia. In its more typical and developed state, the thallus, which often spreads extensively, is limited and usually intersected by the black hypothallus, so that, as Dillenius says, "it is divided, as it were, into compartments like a map," whence its specific name. When the thallus is contiguous at the circumference, it is var. *contigua* (Mudd *l. c.*; *Lecidea geographica* var. *contigua* Fr. Lich. Eur. p. 327 (1831); f. *contigua* Leight. Lich. Fl. ed. 3, p. 373). The numerous apothecia situated either on or between the areolæ are at times more or less confluent, the margin usually very thin is occasionally more developed, becoming tumid and prominent (var. *urceolatum* Mudd *l. c.*; *Lecidea geographica* var. *urceolata* Schær. Enum. p. 106 (1850); f. *urceolata* Leight. *l. c.* p. 374).

Hab. On rocks and boulders, granitic, schistose, quartzose and arenaceous, from maritime to alpine situations.—*Distr.* General and abundant in most parts of Great Britain, where it attains the summits of the highest mountains; not uncommon in the Channel Islands; apparently rarer in Ireland.—*B. M.* La Moye, Jersey; Islands of Guernsey and Alderney; Pentire, St. Minver, Temple Moor and Lamynack Cliff, near Penzance, Cornwall; Dartmoor, Devon; near Richard's Lock, Ulting, Essex; Bardon Hill and Charnwood Forest, Leicestershire; Malvern Hill, Worcestershire; Cader Idris, Aberdovey, Barmouth and Corwen, Merioneth; Glyder and Capel Curig, Carnarvonshire (f. *urceolatum*); Hafod, Cardiganshire; Longmynd, Wrekin Hill, Caer Caradoc and Pontesford Hill, Shropshire; Battersby Moor (f. *urceolatum*), Kildale Moor and Lounsdale, Cleveland, Yorkshire; Teesdale, Durham; Lamplugh, Cumberland, The Cheviots, Northumberland; near Loch Skene, Moffatdale, Dumfriesshire; Arthur's Seat, Edinburgh; Glen Creran, Argyll; Sidlaw Hills, Forfarshire; Craig Calliach, Ben Lawers and Birnam Hill, Dunkeld, Perthshire; near Portlethen, Kincardineshire; Morrone, Braemar, and Huntly, Aberdeenshire; Ben Nevis, Invernessshire; Cuchullin Hills, I. of Skye; near Loch Shin, Sutherland; Keim-an-Eigh, Cork; Killarney, Kerry.

Var. **atrovirens** Koerb. Syst. Lich. Germ. p. 263 (1855).—Thalline areolæ smaller, more or less scattered and somewhat

convex; hypothallus very distinct, often predominating. Apothecia plane or tumid, situated between the areolæ.—Mudd Man. *l. c.* *Lichen atrovirens* L. Sp. Pl. p. 1607 (1753); Huds. Fl. Angl. ed. 2, p. 525; Lightf. *l. c.*; With. *l. c.* *Lecidea atrovirens* Hook. Fl. Scot. *l. c.*; S. F. Gray Nat. Arr. i. p. 465. *Lecidea geographica* var. *atrovirens* Schær. Spicil. *l. c.*; Cromb. Lich. Brit. p. 93 & Journ. Linn. Soc. xxi. t. 9, f. 4 (1886); Leight. Lich. Fl. p. 346; ed. 3, p. 373.

Perhaps only a less developed thalline condition of the species. When the areolæ are thinly scattered and the hypothallus predominates it is f. *protothallina* Koerb. (*l. c.*). The spermogones are more frequent than when the thallus is more developed, the spermatia cylindrical, nearly straight.

Hab. On rocks and boulders (calcareous excepted) in maritime and mountainous districts.—*Distr.* No doubt similar to that of the species, though seen from comparatively few localities, chiefly in Scotland.—*B. M.* Roughton, Cornwall; Ben-y-gloe, Blair Athole, Perthshire; Portlethen, Kincardineshire; Morrone, Braemar, Aberdeenshire; Hills of Applecross, Rossshire; Letter Hill, Connemara, Galway.

Var. **lecanorinum** Floerke ex Koerb. *l. c.*—Thalline areolæ, somewhat discrete and convex. Apothecia immersed in the areolæ, with a spurious margin; spores usually halonate, submuriform 0,030–40 mm. long, 0,011–16 mm. thick.—*Lecidea geographica* var. *cyclopica* Nyl. Lich. Scand. p. 248 (1861); Leight. Lich. Fl. *l. c.*; f. *cyclopica* ed. 3, p. 374.

Exsicc. Johns. n. 398.

Well distinguished by the somewhat longer spores and by the character of the apothecia, which are single in each of the areolæ and appear as if lecanoroid from the spurious thalline margin.

Hab. On slate rocks.—*Distr.* Rare in upland or mountainous districts in N. England and the Grampians, Scotland.—*B. M.* Lakeside, Ennerdale, Cumberland; Morrone, Braemar, Aberdeenshire.

Var. **geronticum** Th. Fr. Lich. Scand. p. 622 (1874).—Thalline areolæ subplane or convex, scattered or subcontiguous, somewhat rugose, white, subpulverulent. Apothecia plane, immersed in the areolæ.—*Lecidea atrovirens* var. *gerontica* Ach. Meth. p. 45 (1803). *L. geographica* var. *gerontica* Nyl. Lich. Scand. p. 248 (1861); Cromb. Lich. Brit. *l. c.*; Leight. Lich. Fl. p. 347; ed. 3, p. 374.

Well characterized by the colour of the more or less pulverulent thallus, whence Schærer (Spicil. pp. 124, 193) termed it var. *pulverulenta*. It is rather interesting as being the only state of the species which occasionally occurs on a calcareous substratum.

Hab.—On quartzose, occasionally calcareous, boulders and stones in mountainous regions.—*Distr.* Rare on the Grampians, Scotland.—*B. M.* Morrone, Braemar, Aberdeenshire; Ben Nevis, Rossshire.

7. **Rh. viridiatrum** Koerb. Syst. Lich. Germ. p. 262 (1855).—Thallus greenish-yellow, indeterminate, granular-areolate, the

areolæ discrete or crowded, K−, CaCl−, medulla I−); hypothallus little visible. Apothecia small, black, prominent, convex and immarginate; hypothecium blackish; paraphyses coherent, blackish at the tips; spores fusiform-oblong or ellipsoid, 3-septate and sometimes muriform, blackish, 0,018–25 mm. long, 0,009–11 mm. thick; hymenial gelatine deep-blue with iodine—*Rh. geographicum* var. *sphæricum* Mudd Man. p. 221. *Lecidea viridiatra* Floerke Deutsch. Lich. iv. p. 4 (1819). *L. geographica* var. *sphærica* Schær. Enum. p. 106 (1850); f. *sphærica* Leight. Lich. Fl. ed. 3, p. 373 (1879); var. *viridiatra* Leight. Lich. Fl. p. 347 (1871).

Exsicc. Leight. n. 93 pro parte.

Distinguished from the preceding by the smaller spores and by the absence of medullary reaction with iodine (hyphæ not amyloid). The apothecia arise either from the hypothallus or from the areolæ.

Hab. On rocks and boulders in hills and mountainous districts.—*Distr.* Seen from only a few localities in England, Wales and S. Ireland; but no doubt to be detected also in S. Scotland.—*B. M.* Malvern Hills, Worcestershire; Llandegly, Radnorshire; Haughmond Hill and Longmynd, Shropshire; Cliffrigg, Cleveland, Yorkshire; near Bantry, Cork; Croghan, Killarney, Kerry.

8. **Rh. calcareum** Th. Fr. Lich. Arct. p. 236 (1860).—Thallus thickish, white, orbicular, determinate, tartareous, cracked-areolate in the centre, radiate at the circumference (K−, CaCl−); hypothallus wanting. Apothecia immersed or depressed, concave becoming plane, black, sometimes slightly pruinose, the margin thick, becoming thin and flattened; hypothecium blackish-brown; paraphyses conglutinate, olivaceous or brownish towards the apices; spores ellipsoid or oblong-ellipsoid, obtuse, colourless, then brownish or greenish-brown, large, muriform, with a distinct hyaline epispore (halonate), 0,022–30 mm. long, 0,012–18 mm. thick; hymenial gelatine deep-blue with iodine.—*Lichen calcarius* Weis Pl. Crypt. Gött. p. 40 (1770). *L. rimosus* Dicks. Plant. Crypt. i. p. 12 (1785); Engl. Bot. t. (1736)? *L. speireus* Ach. Lich. Suec. Prodr. p. 59 (1798); Engl. Bot. t. 1864. *Lecidea speirea* Ach. Meth. p. 52 (1803); S. F. Gray Nat. Arr. i. p. 468; Hook. in Sm. Engl. Fl. v. p. 180; Tayl. in Mackay Fl. Hib. ii. p. 125. *L. contigua* subsp. *confluens* f. *calcarea* Nyl. Lich. Scand. p. 225 (1861); Cromb. Lich. Brit. p. 80. *L. rimosa* Leight. Lich. Fl. p. 350 (1871); ed. 3, p. 379. *Diplotomma calcareum* Koerb. Syst. Lich. Germ. p. 220 (1855); Mudd Man. p. 219.

Exsicc. Johns. n. 397.

Hab. On calcareous rocks.—*Distr.* Not uncommon in maritime or upland regions of the British Isles.—*B. M.* Downs and Newhaven, Sussex; Llanymynech, Shropshire; Beddgelert and Snowdon, Carnarvonshire; Llangollen, Denbighshire; I. of Anglesea; near Buxton, Derbyshire; Carlton Bank, Cleveland, Yorkshire; Eglestone and Teesdale, Durham; Hartside Fell, Cumberland; Achosragan Hill,

Appin, Argyll; Ben-y-Gloe, Ben Lawers and Craig Tulloch, Blair Athole, Perthshire; Canlochan, Forfarshire; Craig Guie and Morrone, Braemar, Aberdeenshire; Portmarnock, near Dublin.

9. **Rh. petræum** Massal. Ric. Lich. p. 102 (1852) (non Koerb.).—Thallus white or greyish-white, orbicular, determinate, thin, wrinkled or almost smooth, subcontinuous or cracked-areolate, sometimes thin and almost disappearing (K−, CaCl−, I−); hypothallus evanescent. Apothecia black, small, usually growing in concentric lines, appressed or subinnate, somewhat concave or plane, marginate, the margin thick and often white-pruinose; hypothecium blackish-brown; spores oblong, muriform, colourless or slightly brownish, halonate, 0,025–44 mm. long, 0,011–17 mm. thick; hymenial gelatine deep-blue with iodine.—*Lichen petræus* Wulfen in Jacquin Collectan. Botan. iii. p. 116, t. 6, f. 4 (1789). *L. concentricus* Davies in Trans. Linn. Soc. ii. p. 284 (1794); Engl. Bot. t. 246; With. Arr. ed. 3, iv. p. 18. *Lecidea petræa* Ach. Meth. p. 37 (1803); S. F. Gray Nat. Arr. i. p. 463; Hook. in Sm. Engl. Fl. p. 175; Tayl. in Mackay Fl. Hib. ii. p. 117 pro parte; subsp. *concentrica* Nyl. Lich. Scand. p. 234 (1861); Cromb. Lich. Brit. p. 87. *L. concentrica* Leight. Lich. Fl. p. 349 (1871); ed. 3, p. 378. *Rhizocarpon petræum* var. *concentricum* Mudd Man. p. 220 (1861).

Exsicc. Leight. n. 17; Johns. n. 355.

The specific name *petræum* has been given by later British authors to forms now included under *Rh. confervoides*, but Wulfen's description and figure of *Lichen petræus* undoubtedly represent this species with its concentrically arranged apothecia, and his name takes precedence of the more characteristic *concentricus* of Davies. Sometimes it is regarded as only a variety of the preceding species, but is easily recognized and differentiated, even when the thallus is almost evanescent, by the peculiar lines formed by the contiguous apothecia. Leighton's f. *typica* (Lich. Fl. ed. 3, p. 378) is a condition in which the thallus is well developed and almost continuous; in f. *impressula* Leight. and f. *coarctata* Leight. (*l. c.* p. 379) the apothecia are more concave and at times circumscissed; in the latter the thallus is also diffuse or scattered. The spermogones are not uncommon, the spermatia rod-shaped, 0,006 mm. long, 0,0006 mm. thick.

Hab. On rocks, chiefly calcareous, more rarely schistose and arenaceous.—*Distr.* Frequent in maritime and upland regions.—*B. M.* Wadebridge, Cornwall; near Beeding and Sullington Heath, Sussex; Ullacombe, Dartmoor, Devon; Leith Hill, Surrey; Wickwar, Gloucestershire; Malvern Hills, Worcestershire; near Ledbury, Herefordshire; Oswestry, Shropshire; Cader Idris and Dolgelly, Merioneth; Capel Curig, Carnarvonshire; Llangollen, Denbighshire; I. of Anglesea; Bilsdale, Cleveland, Yorkshire; Pentland Hills, near Edinburgh; near Balmerino, Fife; Baldoran, Forfarshire; Glen Lochay, Killin, Perthshire; Killarney, Kerry.

Var. **excentricum** A. L. Sm. (non Boist. Nouv. Fl. Lich. pt. 2, p. 240 (1902).—Thallus whitish, effuse, less developed than in the species, sometimes almost evanescent. Apothecia numerous,

scattered irregularly over the thallus, rarely in indistinct lines, sometimes innate and circumscissed as in the species.—*Lecidea petræa* var. *excentrica* Ach. Meth. p. 37 (1863); subsp. *excentrica* Nyl. Lich. Scand. p. 234; Cromb. Lich. Brit. p. 87. *L. concentrica* var. *excentrica* Leight. Lich. Fl. p. 350 (1871). *L. excentrica* Leight. Lich. Fl. ed. 3, p. 379 (1879).

Exsicc. Larb. Lich. Hb. n. 75; Mudd n. 194 (as *Diplotomma calcareum*).

Hab. On calcareous rocks.—*Distr.* Somewhat rare throughout the British Isles.—*B. M.* Jersey; Builth, Brecknockshire; Llanymynech, Shropshire; Dolgelly and Cader Idris, Merioneth; Carlton Bank, Cleveland, Yorkshire; Achosragan Hill, Appin, Argyll; Morrone, Braemar, Aberdeenshire.

10. **Rh. confervoides** DC. Fl. Franc. ii. p. 565 (1805) emend. (non Massal.).—Thallus subdeterminate or effuse, often in small patches, greyish-white or -brown, finely areolate, the areolæ contiguous or dispersed, convex or depressed, on a thin black spreading often fimbriate hypothallus. Apothecia numerous, moderate in size, black, innate-sessile, plane, with a thin margin; hypothecium thick, brownish-black; paraphyses stoutish, lax, clavate and greenish-brown at the tips; spores oblong, ovate or ellipsoid, at first colourless, becoming dark-coloured, halonate, irregularly muriform, 0,020–38 mm. long, 0,010–17 mm. thick; hymenial gelatine blue with iodine.—*Rh. petræum* Koerb. Syst. Lich. Germ. p. 260 (1855) pro parte (non Massal.); Mudd Man. p. 220 (excl. vars.). *Lecidea petræa* Tayl. in Mackay Fl. Hib. ii. p. 117 (1836) pro parte; Flot. ex Nyl. in Act. Soc. Linn. Bord. ser. 3, i. p. 374 (1856) (excl. vars.); Cromb. Lich. Brit. p. 86 (excl. vars.); Leight. Lich. Fl. p. 347; ed. 3, p. 375. *L. amphibia* Fr. Lich. Eur. p. 307 (1831) fide Nyl. Lich. Scand. p. 234 (1861); Cromb. in Journ. Bot. viii. p. 98 (1870).

Exsicc. Leight. n. 159, 189 (in B.M. set as *Lecidea verruculosa*); Mudd n. 195; Larb. Lich. Hb. n. 234 (as var. *cinereum*); Johns. n. 354.

Has been frequently confused with *Lichen petræus* Wulfen as already noted. A leading character, as described by De Candolle, is the rhizoid-like hypothallus which, along with the often dispersed, mostly flat thalline areolæ, distinguishes it from the allied species. The apothecia are usually marginate and sometimes minutely umbonate.

Nylander (Flora lxiv. p. 188 (1881)) and others distinguish two species, morphologically alike, but differing in their reaction to potash. In one no reaction follows, in the other, *Rh. eupetræum* A. Zahlbr. a yellow colour results followed by red. The specimens of *Rh. confervoides* in the British Museum give no reaction with potash. Several forms are recorded by Leighton (Lich. Fl. ed. 3, p. 375) to represent various states of the thallus: in f. *albicans* (*Rh. petræum* f. *albicans* Flot. ex Koerb. *l. c.*) the whitish thalline areolæ are crowded, almost concealing the hypothallus; in f. *cinereum* (Flot. *l. c.*), often found on stones and flints, the fimbriate hypothallus spreads

over the smooth surface of the substratum, outdistancing the thalline areolæ. It predominates also in f. *coracinum* (Flot. *l. c.*) where the areolæ are dark and diffuse, in f. *dispersum* Leight. where they are light coloured and scattered, and in f. *fuscescens* Leight. where the areolæ are also light in colour but contiguous and very thin.

Hab. On hard rocks, granitic, schistose, or siliceous.—*Distr.* General and common throughout the British Isles.—*B. M.* St. Boniface Down, Ventnor, I. of Wight; Lyndhurst, Hants; Beeding Downs, Stanmer Park and Hastings, Sussex; Shiere, Surrey; Highbeach, Epping Forest, Essex; Bosbury Ring and Caer Caradoc, Shropshire; Middletown Hill, Montgomeryshire; Barmouth and Dolgelly, Merioneth; Thetford Warren, Norfolk; Cliffrigg, Lounsdale and Ayton, Cleveland, Yorkshire; Portlethen, Kincardineshire; Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire; Cork; Killree, Clare; Howth, Dublin.

11. **Rh. postumum** Th. Fr. Lich. Scand. p. 634 (1874).—Thallus effuse, thin, subgranulose, scattered or evanescent, greyish (K −, CaCl−, medulla I −). Apothecia subminute, somewhat plane and thinly margined, at length convex and immarginate, black, paraphyses concrete; epithecium and hypothecium brownish; spores (6–) 8 in the ascus, ellipsoid-oblong, 3-septate, usually with a few oblique or longitudinal septa, colourless or at length brownish, scarcely halonate, 0,015–16 mm. long, 0,006–7 mm. thick, or shorter and rather thicker; hymenial gelatine bluish, the asci wine-red with iodine.—*Lecidea postuma* Nyl. in Flora li. p. 345 (1868); Cromb. in Journ. Bot. vii. p. 50 (1869) & Lich. Brit. p. 87; Leight. Lich. Fl. p. 328, ed. 3, p. 349.

A rather obscure plant, related to *Rh. confervoides*, of which Nylander says it would almost appear to be a starved condition, with smaller spores. In the two specimens gathered the thallus is scarcely visible, except around the somewhat scattered apothecia.

Hab. On calcareous stones among detritus in an alpine situation.—*B. M.* Ben Lawers, Perthshire.

12. **Rh. distinctum** Th. Fr. Op. cit. p. 625.—Thallus greyish or brownish, minutely areolate, the areolæ plane or slightly convex (K − or slightly brownish, CaCl −); hypothallus black. Apothecia rather small, depressed, plane, thinly margined or immarginate; hypothecium purplish-brown; paraphyses slender, involved in mucus, purplish-brown at the tips; spores oblong, ellipsoid, or irregular in form, colourless, becoming pale-olive, 1–5-septate and muriform, halonate, 0,024–32 mm. long, 0,012–15 mm. thick; hymenial gelatine deep-blue with iodine.

Differs from *Rh. confervoides* in the purple colour of hypothecium and epithecium.

Hab. On granitic or sandstone rocks, rare.—*B. M.* Morrone, Braemar, Aberdeenshire.

13. **Rh. obscuratum** Massal. Ric. Lich. p. 103 (1852).—Thallus greyish- or pale-brown, thin, minutely areolate, the areolæ contiguous or dispersed, nearly plane, sometimes evan-

escent (K+pale-yellow, CaCl−); hypothallus black, often obsolete. Apothecia black, varying in size, plane, innate-sessile or adnate with an obtuse, thick margin, which rarely almost disappears; hypothecium brownish-black; paraphyses slender, coherent, dark-brown towards the apices; spores oblong-ellipsoid, colourless, becoming brownish, muriform, halonate, 0,024–50 mm. long, 0,012–18 mm. thick; hymenial gelatine deep-blue with iodine. —*Rh. petræum* var. *lavatum* Mudd Man. p. 220 (1861). *Lecidea petræa* var. *obscurata* Ach. Lich. Univ. p. 156 (1810); f. *lavata* Cromb. Lich. Brit. p. 86 (1870). *L. obscurata* Schær. Spicil. p. 130 (1828); Leight. Lich. Fl. ed. 3, p. 377. *L. atroalba* var. *concreta* Wahlenb. Fl. Lapp. p. 471 (1812). *L. concreta* Leight. Lich. Fl. p. 351 (1871). *L. lavata* Nyl. in Flora lvi. p. 23 (1873); Cromb. in Journ. Bot. xi. p. 135 (1873); Leight. Lich. Fl. ed. 3, p. 378.

The thallus is occasionally shining and almost copper-brown or sometimes tinged a rusty-red (f. *ferrata* Nyl. Lich. Scand. p. 234 (1861)). The apothecia vary in size, but are usually rather large, strongly marginate, and occasionally also umbonate. When growing on rocks liable to be submerged, the thallus almost disappears (f. *lavata*).

Hab. On rocks.—*Distr.* Somewhat rare in upland or subalpine regions.—*B. M.* Pulborough, Sussex; Llandyssil, Cardiganshire; Aberdovey, Merioneth; Nant Francon and Trefriw Falls, Carnarvonshire; Caradoc, Shropshire; near Thirsk, Yorkshire; Portlethen, Kincardineshire; Barcaldine, Argyll; Stirlingshire; Ben Lawers, Perthshire (f. *ferrata*); Glen Callater, Braemar, Aberdeenshire; Ben Nevis, Invernessshire; Applecross, Rossshire; Killarney, Kerry.

14. **Rh. plicatilis** A. L. Sm.—Thallus dirty-white, minutely plicate or warted, cracked-areolate (K+yellow, CaCl+yellow); hypothallus brown. Apothecia blackish-brown, large, closely adnate, sometimes connate, the margin obtuse, undulate, becoming attenuate and obliterated in age; hypothecium thick, blackish-brown paraphyses stoutish, subdiscrete, yellowish-brown at the tips; spores 4–8 in the ascus, elongate-ellipsoid, muriform, colourless, becoming faintly brownish, halonate, 0,027–30 mm. long, 0,009–10 mm. thick; hymenial gelatine deep-blue with iodine.—*Rh. coniopsoideum* Hepp ex Arnold in Flora lxvii. p. 593 (1884) (fide Arnold). *Lecidea plicatilis* Leight. in Ann. Mag. Nat. Hist. ser. 4, iv. p. 201 (1869) & Lich. Fl. p. 351; ed. 3, p. 380; Cromb. in Journ. Bot. viii. p. 98 (1870). *L. coniopsoidea* Hue in Bull. Soc. Linn. Norm. sér. 4, viii. p. 314 (1894).

Hue *l. c.* notes that in some specimens the thallus changes from yellow to red on the application of potash.

Hab. On alpine rocks.—*B. M.* Llyn-y-Cae, Cader Idris, Merioneth.

15. **Rh. geminatum** Koerb. Syst. Lich. Germ. p. 259 (1855), emend. Th. Fr. Lich. Scand. p. 623 (1874).—Thallus subeffuse, warted-areolate, the areolæ contiguous or somewhat scattered,

greyish-white or -brown (K + brownish, CaCl + pale-yellowish-brown, medulla I−); hypothallus thin, black. Apothecia small, black, subsessile, plane with a thin entire margin; hypothecium blackish-brown; paraphyses slender, dark-brown at the apices; spores 1 or 2 in the ascus, ellipsoid or oblong-ellipsoid, at first colourless, becoming brownish-black, muriform, large, often broadly halonate, 0,040–57 mm. long, 0,023–32 mm. thick; hymenial gelatine deep-blue with iodine.—*Rh. Montagnei* Flot. ex Koerb. Syst. Lich. Germ. p. 258 (1855); Mudd Man. p. 219. *Lecidea geminata* Flot. ex Nyl. in Ach. Soc. Linn. Bord. p. 375 (1856); Cromb. Lich. Brit. p. 87; Leight. Lich. Fl. p. 349; ed. 3, p. 377.

Hab. On alpine rocks.—*B. M.* Craig Guie, Braemar, Aberdeenshire.

79. **BOMBYLIOSPORA** De Not. in Massal. Ric. Lich. p. 114 (1852). (Pl. 16.)

Thallus crustaceous. Algal cells *Protococcus*. Apothecia light- or dark-coloured with a proper margin only; ascus 1-(8-) spored; spores large, elongate-ellipsoid, colourless or faintly coloured, without a mucilaginous epispore (not halonate), multiseptate.

The only representative of this genus in the British Isles has a 1-spored ascus. The spermogones have simple sterigmata and cylindrical, straight spermatia.

1. **Bombyliospora incana** A. L. Sm.—Thallus effuse, thickish, glaucous-green when wet, creamy-yellow when dry, granular-leprose (K+yellowish, CaCl−). Apothecia large, adnate, plane or tumid, reddish-brown, the margin obtuse, persistent, paler; hypothecium brownish; paraphyses slender, discrete, bright-yellowish-brown at the tips; spores elongate-ellipsoid, usually 7–10-septate, 0,070–160 mm. long, 0,025–35 mm. thick; hymenial gelatine yellowish, the asci reddish, with iodine.—*Lichen incanus* Ach. Lich. Suec. Prodr. p. 7 (1798)? Sm. Engl. Bot. t. 1683 (1807). *Lecidea incana* S. F. Gray Nat. Arr. i. p. 470 (1821); Hook. Fl. Scot. p. 38 & in Sm. Engl. Fl. v. p. 181, pro parte; Tayl. in Mackay Fl. Hib. ii. p. 126? *Biatora pachycarpa* Fr. Lich. Eur. p. 259 (1831). *Lecidea pachycarpa* Duf. ex Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 364 (1856); Cromb. Lich. Brit. p. 75; Leight. Lich. Fl. p. 336; ed. 3, p. 361. *Bombyliospora pachycarpa* Massal. Ric. Lich. p. 115, fig. 226 (1852); Mudd Man. p. 189.

Sometimes confused with *Buellia canescens* (*Lichen incanus* Relhan non Smith) (see p. 166).

Hab. On the trunks of old trees and on shady rocks in upland wooded districts.—*Distr.* Only sparingly in a few localities of S. England, N. Wales and S. Ireland.—*B. M.* New Forest, Hants; St. Leonard's Forest, Sussex; Ulting, Essex; Cwm Bychan, Merioneth; Dinish Island, Cromaglown, Killarney and Dunkerron, Kerry.

80. **LOPADIUM** Koerb. Syst. Lich. Germ. p. 210 (1855). (Pl. 17.)

Thallus crustaceous. Algal cells *Protococcus*. Apothecia light- or dark-coloured with a proper margin only; ascus normally 1-spored sometimes 4–8-spored; spore large, colourless or brownish, without a mucilaginous epispore (not halonate), muriform. Spermogones with septate sterigmata and short straight ovate or ellipsoid spermatia.

1. **L. pezizoideum** Koerb. *l. c.* — Thallus effuse, thinnish, granulose- or subsquamulose-concrescent, dark-grey or brownish (K−, CaCl−). Apothecia elevated, moderate, somewhat concave, brownish-black, white within under the epithecium, the margin thin, entire, inflexed, paler; hypothecium brownish-black; paraphyses thickish, concrete, black at the apices; spores solitary, ellipsoid, brownish, large, 0,065–110 mm. long, 0,030–46 mm. thick; hymenial gelatine not tinged, but the asci reddish-wine-coloured with iodine.—Mudd Man. p. 190. *Lecidea pezizoidea* Ach. Lich. Univ. p. 182 (1810); Cromb. Lich. Brit. p. 75; Leight. Lich. Fl. p. 348; ed. 3, p. 375.

A rather variable plant as to the character of the thallus and the size of the apothecia in countries where it is more common than in Great Britain. Our specimens, which are only muscicolous, represent the type as described by Acharius. In these, which are well fertile, the thallus, when wet, is more or less brownish-green.

Hab. Incrusting mosses on rocks, rarely on earth in their crevices in alpine situations.—*Distr.* Extremely local, having been met with only on the Grampians, Scotland.—*B. M.* Craig Calliach and near the summit of Ben Lawers, Perthshire; Braemar, Aberdeenshire.

2. **L. fuscoluteum** Mudd Man. p. 190, t. 3 fig. 73 (1861).—Thallus effuse, thin, granulose-verrucose, white or greyish-white (K+yellow, CaCl−). Apothecia moderate or somewhat large, elevato-sessile, at first slightly concave, then plane, sordid-orange-coloured, ochraceo-pruinose, the margin persistent, thick, inflexed, paler; hypothecium colourless; paraphyses slender, subconcrete, tawny at the apices; epithecium granulose, K+purplish; spores solitary, colourless, ellipsoid or oblong, at times difform, 0,048–100 mm. long, 0,024–55 mm. thick; hymenial gelatine sordid-bluish, then, especially the asci, deep-red or tawny with iodine.—*Lichen fuscoluteus* Dicks. Pl. Crypt. ii. p. 18, t. 6. f. 2 (1790); Engl. Bot. t. 1007; With. Arr. ed. 3, iv. p. 24. *Lecidea fuscolutea* Ach. in Vet. Acad. Handl. 1808, p. 266; S. F. Gray Nat. Arr. i. p. 472; Hook. in Sm. Engl. Fl. v. p. 183; Cromb. Lich. Brit. p. 75; Leight. Lich. Fl. p. 351; ed. 3, p. 380.

Exsicc. Cromb. n. 87.

Hab. Incrusting decaying mosses in alpine places.—*Distr.* Rare in N. England and the Highlands of Scotland.—*B. M.* Teesdale, Durham; north side of Loch Tay, Ben Lawers and Craig Calliach, Killin, Perthshire; Ben Cruachan, Argyll.

3. **L. fecundum** Th. Fr. Lich. Arct. p. 202 (1860).—Thallus effuse, verrucose-granulose, the granules concrete, often subfurfuraceous, brownish- or greenish-grey (K−, CaCl−). Apothecia small, sessile, appressed, black, at first concave, then somewhat plane, the margin entire, at length excluded; hypothecium brownish or reddish-brown; paraphyses slender, conglutinate, blackish at the apices; spores 8 in the ascus, oblong, often narrowed at one or the other apex, 0,022–40 mm. long, 0,010–18 mm. thick; hymenial gelatine deep bluish with iodine. —*L. sociale* Koerb. Parerg. Lich. p. 174 (1860). *Biatora socialis* Hepp ex Koerb. *l. c.* *Lecidea fecunda* Nyl. ex Stiz. Lich. Helv. p. 171 (1882); Cromb. in Grevillea xxii. p. 59 (non Leight. Lich. Fl. ed. 3, p. 374, fide Cromb. MS.). *L. socialis* Cromb. in Journ. Bot. xx. p. 275 (1882).

Crombie in MS. notes has rejected Leighton's description and the specimen collected near the Wrekin, Shropshire. I have not seen the specimen.

Hab. On dead mosses among rocks in an alpine locality.—*Distr.* Very scarce on one of the S. Grampians, Scotland.—*B. M.* Summit of Craig Calliach, Perthshire.

Tribe XIX. GRAPHIDEI.—Nyl. in Mém. Soc. Sci. Nat. Cherb. iii. p. 187 (1855) emend.

Thallus shrubby or crustaceous, sometimes developed under the bark (hypophlœodal), often little visible or wanting. Algal cells (*gonidia*) Chlorophyceæ (*Trentepohlia* or rarely *Palmellaceæ*). Apothecia roundish or irregular (*ardellæ*), or linear (*lirellæ*), immarginate or with a proper margin only.

The *Graphidei* are distinguished by the presence of chrysogonidia (*Trentepohlia*) in the thallus, and by the form of the apothecia. There are six British Natural Orders:—

DIRINACEÆ.—Thallus crustaceous, corticate on upper surface. See *DIRINA* (Part I. pp. 490–491).

ROCCELLACEÆ. — Thallus laciniate, strap-shaped or roundish, corticate on both surfaces. See *ROCCELEI* (Part I. pp. 181–184).

LECANACTACEÆ. — Thallus crustaceous, not corticate. Apothecia irregularly roundish, usually marginate.

ARTHONIACEÆ. — Thallus crustaceous, not corticate. Apothecia irregularly roundish, linear or stellate, immarginate.

GRAPHIDACEÆ. — Thallus crustaceous, not corticate. Apothecia linear, marginate.

CHIODECTONACEÆ.—Thallus crustaceous, not corticate Apothecia aggregate in stroma-like portions of the thallus.

LECANACTACEÆ.

Thallus crustaceous. Algal cells, *Trentepohlia*. Apothecia roundish or oblong, immersed or sessile, immarginate or with a proper margin only; spores elongate, pluriseptate; paraphyses branched, confluent.

This order has affinities with the *Lecideei* as well as with the *Graphidei;* to the latter it is more closely related by the algal symbionts, and by the form of the apothecia. There are two British genera :—

Apothecia with a proper margin ..... 81. **Lecanactis.**
Apothecia without a proper margin ... 82. **Platygrapha.**

81. **LECANACTIS** Eschw. Syst. Lich. p. 14 (1824) emend.; Koerb. Syst. Lich. Germ. p. 275 (1855). *Schismatomma* Flot. & Koerb. ex Massal. Ric. Lich. p. 55 (1852); Mudd Man. p. 222. (Pl. 18.)

Thallus crustaceous. Apothecia roundish with a cupular carbonaceous proper margin; hypothecium carbonaceous; ascus clavate, 8-spored; spores fusiform or acicular, 3- or 5-septate, colourless. Spermogones with cylindrical spermatia.

1. **L. premnea** Weddell in Mém. Soc. Sci. Nat. Cherb. xix. p. 295 (1875).—Thallus effuse, thin, dark-greyish or -greenish or evanescent (K−, CaCl−). Apothecia moderate in size, black, naked or dark-greenish-pruinose, with a thin prominent flexuose proper margin; hypothecium black, paraphyses lax, blackish-brown at the tips; spores oblong-fusiform, straight or slightly curved, 5-septate, 0,018–25 mm. long, 0,005–7 mm. thick; hymenial gelatine yellowish-red with iodine.—*Lichen abietinus* Sm. Engl. Bot. t. 1682 (1807) (non Ach.); Leight. Angioc. Lich. p. 66, t. 28, f. 3 (1851). *Lecidea premnea* Ach. Lich. Univ. p. 173 (1810); Tayl. in Mackay Fl. Hib. ii. p. 119; Hook. in Sm. Engl. Fl. v. p. 176; Cromb. Lich. Brit. p. 90; Leight. Lich. Fl. p. 337; ed. 3, p. 364. *Schismatomma premneum* Mudd Man. p. 222 (1861). *Exsicc.* Bohl. n. 101; Carroll Lich. Hib. n. 15; Mudd n. 197; Leight. n 124.

Sometimes confused with *Biatorina premnea*, which is externally very similar, but has larger apothecia. The pruina when visible is always darker than in the following species, which is further distinguished by the size and septation of the spores.

Hab. On old trunks of trees.—*Distr.* Not uncommon in England and S. and W. Ireland, rare in Scotland.—*B. M.* Near Saltram, Bovey Tracey, Lustleigh and Lynmouth, Devon; Shanklin, I. of Wight; New Forest, Hants; Fletching, Hassock's Gate and Parham Park, Sussex; Penshurst, Kent; Hainault Forest, Thorndon Hall, Langford and Danbury Park, Essex; near Purton, Gloucestershire; Moccas Court and Brampton Bryan Park, Herefordshire; Norton,

Worcestershire; Bradgate Park, Leicestershire; Harborough Magna, Warwickshire; Nannau, Dolgelly, Merioneth; Abdon and Haughmond Hill, Shropshire; Ickworth, Suffolk; Nottinghamshire; Derbyshire; Kildale, Cleveland, Yorkshire; Castle Bernard Park, Bandon, Cork; Derryquin, Kerry; Adare Abbey, Limerick.

Var. **saxicola** A. L. Sm.—Thallus greyish-green, thin, furfuraceous. Apothecia black, sessile, greenish-pruinose or naked, otherwise as in the species. *Schismatomma premneum* var. *saxicolum* Mudd Man. p. 222 (1861). *Lecidea premnea* f. *saxicola* Leight. Lich. Fl. ed. 3, p. 365 (1879).

Exsicc. Leight. n. 185; Mudd n. 198; Larb. Lich. Hb. n. 73.

Differing mainly in the habitat. Leighton distinguishes two other saxicolous forms: *teichogena* and *crenatula* (*Lecidea premnea* f. *teichogena* Nyl. ex Leight. *l. c.*, and f. *crenatula* Nyl. ex Leight. *l. c.*), both with scanty or evanescent thallus, the apothecia naked, the margin somewhat crenulate or flexuose in the latter.

Hab. On rocks, walls, &c.—*Distr.* Rare in the Channel Islands, England and W. Ireland.—*B. M.* La Moye, Jersey; Ventnor, I. of Wight; Nesscliffe, Shropshire; Airyholme Wood, Cleveland, Yorkshire; Doughruagh Mt., Kylemore, Connemara, Galway.

2. **L. abietina** Koerb. Syst. Lich. Germ. p. 276 (1855).—Thallus white or greyish-white, effuse, thin, furfuraceous (K−, CaCl−). Apothecia moderate in size or larger, sessile, with a thickish, prominent margin, black, but thickly whitish- or pale-yellowish-pruinose; hypothecium black; paraphyses slender conglutinate; epithecium brownish; spores acicular-fusiform, 3-septate, 0,035–40 mm. long, 0,004–4 mm. thick; hymenial gelatine slightly bluish then wine-red with iodine.—*Lichen abietinus* Ach. in Vet. Acad. Handl. xvi. p. 139, t. 5, f. 7 (1795). *Sphæria leucocephala* Pers. Syn. Fung. Add. p. xxvii. (1801) (*spermogoniiferous*). *Verrucaria leucocephala* Ach. Meth. p. 116 (1803); Borr. in Engl. Bot. Suppl. t. 2642, f. 2; Hook. in Sm. Engl. Fl. v. p. 152; Tayl. in Mackay Fl. Hib. ii. p. 90. *Pyrenothea leucocephala* Fr. Lich. Eur. p. 450 (1831); Leight. Angioc. Lich. p. 65, t. 28, ff. 1 & 2. *Lecidea abietina* Ach. Lich. Univ. p. 188 (1810); S. F. Gray Nat. Arr. i. p. 468; Hook. in Sm. Engl. Fl. v. p. 179; Cromb. Lich. Brit. p. 90; Leight. Lich. Fl. p. 330; ed. 3, p. 354. *Schismatomma abietinum* Massal. Ric. Lich. p. 56, f. 102 (1852); Mudd Man. p. 223.

Exsicc. Leight. nos. 163 & 164; Mudd n. 200; Johns. n. 349.

Differs from the preceding in the dense whitish pruina covering more especially the apothecia. The spermogones (*Sphæria leucocephala*) which have rather large spermatia (0,012–16 mm. long, 0,003–4 mm. thick), are sometimes alone present, and resemble small whitish-grey globules. Leighton (Angioc. Lich. pp. 66 & 67, t. 28, ff. 6 & 7) describes two somewhat similar forms: *Pyrenothea rudis* (*Exsicc.* n. 102 as *P. vermicellifera*) and *P. aphanes* (*Verrucaria rudis* and *V. aphanes* Borr. Engl. Bot. Suppl. t. 2642, ff. 1 and 3 (1830)). These are also quoted by Hooker in Sm. Engl. Fl. v. p. 151,

who points out the affinity of *V. aphanes* with *V. leucocephala;* but the perithecia are darker in colour; the spermatia are also much smaller, about 0,005 mm. long and 0,001–2 mm. thick.

Hab. On trunks of trees.—*Distr.* Rather rare in S. and N. England and in S. Ireland.—*B. M.* Dartmoor, Devon; New Forest, Hants; Henfield, Sussex; Ickworth, Suffolk; Stogdale and Westerdale, Cleveland, Yorkshire; Cromaglown, Eagle's Nest and Croghan, Killarney, Kerry.

Form **incrustans** Oliv. Exp. Syst. Lich. ii. 1, p. 46 (1900).—Thallus greyish, thicker than in the species.—*Cyphelium incrustans* Ach. in Vet. Acad. Handl. 1817, p. 230, t. 8, f. 6. *Lecidea abietina* f. *incrustans* Nyl. Lich. Scand. p. 241 (1861); var. *incrustans* Cromb. in Journ. Bot. xx. p. 275 (1882).

Hab. Incrusting mosses and hepatics on rocks.—*Distr.* Rare in S. England.—*B. M.* Near Eridge, Sussex.

3. **L. illecebrosa** Fr. Syst. Orb. Veg. p. 288 (1825); Koerb. Syst. Lich. Germ. p. 277.—Thallus effuse, thin, pulverulent or subgranulose, white (K−, CaCl−). Apothecia small, black, plane and thinly margined, at length convex and immarginate, white-pruinose, black within; hypothecium brownish-black; paraphyses concrete; spores fusiform, 1–5-septate; 0,016–21 mm. long, 0,003–4 mm. thick; hymenial gelatine tawny-wine-reddish with iodine.—*Lichen amylaceus* Ehrh. Fl. Crypt. n. 303 (1793), nomen. *Opegrapha illecebrosa* Duf. in Journ. Phys. lxxxvii. p. 213 (1818) (fide Fries). *Schismatomma amylaceum* Massal. Ric. Lich. p. 56, f. 103 (1852); Mudd Man. p. 222. *Lecidea amylacea* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 383 (1856). *L. corticola* var. *farinosa* Ach. Lich. Univ. p. 187 (1810). *L. farinosa* Cromb. Lich. Brit. p. 90 (1870) (excl. subsp.); Leight. Lich. Fl. p. 340; ed. 3, p. 365.

Hab. On old trunks of trees.—*Distr.* Rare in S. England.—*B. M.* Bramble Hill, New Forest, Hants.

4. **L. Dilleniana** Koerb. Syst. Lich. Germ. p. 276 (1855).—Thallus effuse, thinnish, soft, granular-areolate, verrucose or wrinkled, greyish-white often somewhat white-pruinose (K + yellowish, CaCl + orange-yellow). Apothecia rather small, black, appressed, sessile, plane, marginate, white-pruinose or naked, the margin thin, entire, or flexuose; hypothecium blackish-brown; paraphyses slender, coherent; epithecium brownish; spores narrowly fusiform, 3-septate, 0,023–32 mm. long, 0,005–6 mm. thick; hymenial gelatine pale-bluish then tawny-wine-red with iodine.—*Lichen Dillenianus* Ach. Lich. Suec. Prodr. p. 57 t. 1, f. 1 (1798). *L. candidus* Sm. Engl. Bot. t. 1138 (1803)? (see also p. 137). *Lecidea Dilleniana* Ach. Meth. p. 55 (1803); Leight. Lich. Fl. p. 332, ed. 3, p. 352 & in Grevillea ii. p. 172, t. 26, f. 1. *L. farinosa* subsp. *Dilleniana* Cromb. Lich. Brit.

p. 90 (1870). *Schismatomma amylaceum* var. *candidum* Mudd Man. p. 222, t. 4, f. 84 (1861).

Exsicc. Mudd n. 199 ; Leight. n. 336 (as *Lecidea amylacea*).

As noted above, the *Lichen candidus* of Engl. Bot. was quoted at p. 137 on Leighton's authority as the original of his *Lecidea Turneri*. Though no spores are to be found in the British Museum specimen, it seems more probable that it belongs here. Leighton had already quoted it as synonymous with his published specimen, *Lecidea amylacea* n. 336.

Hab. On maritime and subalpine rocks.—*Distr.* Rather rare in E. and N. England and the Grampians, Scotland.—*B. M.* Ingleby Park, Cleveland, Yorkshire ; Staveley, Westmoreland ; the Trossachs, Perthshire ; Achallater, Braemar, Aberdeenshire.

5. **L. delimis** A. L. Sm.—Thallus dark-greyish, warted-granular or wrinkled, scattered (K + yellow, CaCl + red) ; hypothallus dark brown limiting the thallus. Apothecia small, black, convex, thinly marginate or immarginate, greyish-pruinose ; hypothecium thick, black ; paraphyses subdiscrete ; epithecium granular, dark in thick section ; spores linear-oblong or somewhat fusiform, 3-septate, slightly constricted at the septa, 0,015–18 mm. long, 0,004–5 mm. thick or longer and narrower, 0,021–23 mm. long, 0,003 mm. thick ; hymenial gelatine tawny-wine-coloured or reddish with iodine.—*Lecidea delimis* Nyl. in Flora lvi. p. 297 (1873) ; Cromb. in Journ. Bot. xii. p. 149 (1874) ; Leight. Lich. Fl. ed. 3, p. 351.

Hab. On rocks.—*B. M.* Mount Orgueil, Jersey (the only locality).

82. **PLATYGRAPHA** Nyl. in Mém. Soc. Sci. Nat. Cherb. iii. p. 188 (1855). (Pl. 19.)

Thallus scanty or evanescent. Apothecia roundish or oblong, simple or rarely divided, immarginate, but with a spurious thalline margin, blackish ; spores 8 in the ascus, fusiform, septate, colourless ; paraphyses slender, more or less discrete. Spermogones with shortly cylindrical straight or slightly arcuate spermatia.

The genus is almost entirely exotic, but of the four known European species, two occur very sparingly in Great Britain.

1. **P. periclea** Nyl. *l. c.* & in Act. Soc. Linn. Bord. sér. 3, i. p. 408 (1856).—Thallus effuse, scanty, very thin, subleprose, white or whitish. Apothecia depressed, rotundate or oblong, at times somewhat difform, black, opaque, concolorous within, the thalline margin at length subevanescent ; spores narrowly fusiform, 3-septate, often curved, 0,030–0,042 mm. long, 0,003–4 mm. thick ; hymenial gelatine bluish then wine-red with iodine.—Martind. in Naturalist, 1886, p. 49. *Lichen pericleus* Ach. Lich. Suec. Prodr. p. 78 (1798).

Like other species of the genus, this might in some states readily be taken for a *Lecanora*, allied to *L. exigua*, to which species

Acharius subsequently referred it (Lich. Univ. p. 355); the name *periclea* has been assigned to *L. exigua* by several British authors (cf. Part I. p. 395). The spermogones have been described as *Pyrenothea stictica* Fr. in Vet. Ak. Handl. 1821, p. 334.

Hab. On the trunks of old oaks and firs in upland tracts of mountainous districts.—*Distr.* Only very sparingly in N.W. England (near Kendal, Westmoreland) and the N. Grampians, Scotland; no doubt to be detected elsewhere.—*B. M.* Near Old Mar Lodge, Braemar, Aberdeenshire.

2. **P. rimata** Nyl. *ll. c.*—Thallus effuse, thin, warted and cracked, whitish. Apothecia impressed in the verrucæ, simple or divided, variously difform, plane or slightly convex, unequal, blackish, somewhat shining, with a narrow spurious thalline margin; hypothecium thick, brownish-black; spores narrowly fusiform, 3-septate, more or less curved, 0,024–34 mm. long, about 0,003–4 mm. thick; hymenial gelatine bluish then wine-reddish with iodine.—Mudd Man. p. 244, t. 4, f. 95; Cromb. Lich. Brit. p. 101; Leight. Lich. Fl. p. 388; ed. 3, p. 411. *Schismatomma dolosum* var. *rimatum* Flot. Lich. Exs. n. 438B (1829) fide Nyl. in Act. Soc. Linn. Bord. *l. c.* *Chiodecton graphidioides* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 395, t. 7, f. 29 (1854).

Differs from the preceding in the verruculose thallus. The verrucæ are somewhat large, prominent, aggregate and wrinkled. The apothecia, which are usually one in each verruca, are rather variable in size and form, being sometimes linear and slightly branched. In the very few British specimens seen the spermogones, rarely present, have the spermatia somewhat arcuate, 0,004–5 mm. long.

Hab. On trunks of trees, ash and elm, in upland wooded situations. —*Distr.* Local and scarce in W. England, N. Wales and Ireland (Loughlinstown, Dublin).—*B. M.* Near Sharpstones Hill, Shropshire; Chirk Castle Park, Denbighshire.

ARTHONIACEÆ.

Thallus crustaceous, thin, often developed under the bark (hypophlœodal), evanescent or wanting. Apothecia roundish or difform (*ardellæ*) or elongate (*lirellæ*); ascus short, pyriform; spores 4 to 8 in the ascus, septate or muriform; paraphyses branched, confluent; spermogones with simple sterigmata and ovate, cylindrical or slender spermatia.

The order is throughout distinguished by the immarginate apothecia which often resemble a small spot or stain on the bark, and by the short pyriform asci. It is represented in Britain by two genera:—

Spores 1- or pluri-septate ..... 83. **Arthonia.**
Spores septate and muriform ..... 84. **Arthothelium.**

83. **ARTHONIA** Ach. in Schrad. Neu. Journ. Bot. i. 3, p. 3 (1806) emend. & Lich. Univ. p. 25 (1810). (Pl. 20.)

Thallus crustaceous, thin or evanescent, sometimes developed under the bark (hypophlœodal). Algal cells *Trentepohlia* or *Palmellaceæ*. Apothecia innate, sessile, immarginate, roundish (*ardellæ*) or elongate (*lirellæ*), plane or tumid; asci pyriform or almost globose, rarely elliptical, thickened at the apices; spores elongate-ovate or clavate, 1- or pluri-septate, colourless or sometimes brownish.

Includes a number of species that have been formerly classified under different genera, according to the form of the thallus or spores; they are grouped in three sections:—

Thallus with *Trentepohlia* gonidia.
Apothecia more or less brightly coloured or brown ..... § i. CONIOCARPON (1-6).
Apothecia blackish ..... § ii. EUARTHONIA (7–20).
Thallus with *Palmella* gonidia, or wanting ..... § iii. LECIDEOPSIS (21–28).

§ i. CONIOCARPON A. Zahlbr. in Engler & Prantl Nat. Pflanzenf. i. 1*, p. 91 (1903).—Coniocarpon DC. Fl. Fr. ii. p. 323 (1805), pro parte; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 433 (1854).

Algal cells *Trentepohlia*. Apothecia brightly coloured or brown, not black; spores 1- or more-septate.

Spores 1-septate.

1. **A. lurida** Ach. Lich. Univ. p. 143 (1810).—Thallus thin, pale-dirty-brown or pale-lead-coloured, smooth, effuse or obsolete. Apothecia (*ardellæ*) reddish or reddish-black, sessile, appressed, irregularly roundish, slightly convex (K+violet or blue); spores broadly ovate, 1-septate, colourless or pale-yellow, 0,010–15 mm. long, 0,004–6 mm. thick; hymenial gelatine dirty-wine-red with iodine.—Borr. Engl. Bot. Suppl. t. 2692, fig. 2; Hook. in Sm. Engl. Fl. v. p. 143; Tayl. in Mackay Fl. Hib. ii. p. 104; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 442, t. 8, fig. 38 (1854) & Lich. Fl. p. 391; ed. 3, p. 414; Mudd Man. p. 250; Cromb. Lich. Brit. p. 102 (excl. f. *vinosa*).

Exsicc. Mudd n. 236; Leight. n. 224 (as *A. vinosa*).

Hab. Usually on the trunks of small trees.—*Distr.* Frequent in England, somewhat rare in the Channel Islands, W. Scotland and in S. Ireland.—*B. M.* Withiel, Cornwall; Balcombe, Blackdown, Handcross and Hurstpierpoint, Sussex; near Becky Falls and Newton Bushel, Devon; New Forest, Hampshire; Gopsall, Leicestershire; Bettws-y-coed and Trefriw, Carnarvonshire; Sutton, near Shrewsbury, Shropshire; Malvern, Worcestershire; Airyholme Wood, Cleveland, Yorkshire; Windermere, Westmoreland; Mangerton and Dunkerron, Kerry.

Var. **spadicea** Nyl. in Mém. Soc. Sci. Nat. Cherb. iv. p. 92 (1856).—Differs from the species in the somewhat darker apothecia and in the shorter unequally divided spores, 0,011–12 mm. long, 0,004–5 mm. thick, the lower cell being frequently elongate, bi-guttulate and spuriously divided.—Mudd Man. p. 251. Subsp. *spadicea* Cromb. Lich. Brit. p. 103 (1870). *Arthonia spadicea* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 442, t. 8, fig. 39 (1854) & Lich. Fl. p. 393; ed. 3, p. 417.

Exsicc. Leight. n. 97.

Hab. On the trunks of trees.—*Distr.* Rare in the Channel Islands, England and S. Ireland.—*B. M.* Jersey; Lustleigh, Devon; Lyndhurst, New Forest, Hants; Midhurst, Sussex; Chedworth Woods, Gloucestershire; by the Wye, near Monmouth; Gopsall, Leicestershire; Barmouth and Dolgelly, Merioneth; Bettws-y-Coed, Carnarvonshire; Shelton Rough, near Shrewsbury, Shropshire; Ayton, Yorkshire; Glendower Wood and Enniskean, Cork; Muckruss and Eagle's Nest, Killarney, Kerry.

2. **A. didyma** Koerb. in Schles. Ges. Denkschr. Breslau 1853, p. 235, emend.; Almqu. in K. Svensk. Vet.-Akad. Handl. xvii. n. 6, p. 13 (1880).—Thallus thin, effuse, smooth or furfuraceous, whitish, or pale-brown. Apothecia small, crowded irregularly, roundish, deep vinous-red or blackish, vinous-red within (K+ violet or blue); spores obovate, colourless becoming brownish, 1-septate, 0,015–18 mm. long, 0,006–8 mm. thick; hymenial gelatine greenish then blue with iodine.—*A. pineti* Koerb. Syst. Lich. Germ. p. 292 (1855); Cromb. Lich. Brit. p. 104. *A. vinosa* Leight. in Ann. Mag. Nat. Hist. ser. 2, xviii. p. 331 (1856) & Lich. Fl. p. 391; ed. 3, p. 414 (incl. var. *pineti* Leight.); Mudd Man. p. 250. *A. lurida* f. *vinosa* Cromb. Lich. Brit. p. 103 (1870). *A. sapineti* Nyl. in Flora lix. p. 239 (1876); Cromb. in Grevillea v. p. 30; Leight. Lich. Fl. ed. 3, p. 415.

Exsicc. Mudd n. 235.

Intimately related to *A. lurida*, but differing in the paler thallus, the somewhat larger spores, and in the reaction of the hymenial gelatine with iodine. Leighton's specimen (n. 224), as noted by Almqu. (*l. c.*), belongs to the preceding species.

Hab. On the bark of trees.—*Distr.* Somewhat rare throughout the British Isles.—*B. M.* Lustleigh, Devon; New Forest, Hants; Danbury, Essex; Brandon Forest, Wilts; Ulchin Wood, Norton, Worcester; Builth, Brecknockshire; Dolgelly, Merioneth; Church Stretton, Shropshire; Gwydir Woods, Bettws-y-Coed, Carnarvonshire; Stagdale, Cleveland, Yorkshire; Barcaldine, Argyll; Aberfeldy, Perthshire; Castle Bernard and Enniskean, Cork; Killery Bay, Connemara, Galway.

3. **A. atrofuscella** Nyl. in Flora lviii. p. 363 (1875).—Thallus whitish-glaucous, smooth. Apothecia minute, punctiform, reddish-black; spores obovate, 1-septate, colourless, becoming brownish,

0,012–16 mm. long, 0,005–6 mm. thick.—Leight. Lich. Fl. ed. 3, p. 415.

Exsicc. Larb. Lich. Hb. n. 193.

Very similar to the last species, but with smaller apothecia and spores.

Hab. On trees, rare.—*B. M.* Doughruagh Mt., Connemara, Galway (the only locality).

Spores 3–4-septate, upper cell largest.

4. **A. gregaria** Koerb. Syst. Lich. Germ. p. 291 (1855.)—Thallus determinate, often developed under the bark (hypophlœodal), greyish or reddish, thin, filmy, sometimes furfuraceous. Apothecia irregularly roundish or elongate, scattered or confluent, the disc plane, depressed, somewhat whitish- or cinnabar-red-pruinose or naked (K+violet); spores obovate-clavate, usually 4-septate, the upper cell largest, colourless or faintly yellowish-red, 0,018–26 mm. long, 0,007–9 mm. thick; hymenial gelatine blue with iodine.—Mudd Man. p. 249. *A. cinnabarina* Wallr. Crypt. Germ. i. p. 320 (1831); Cromb. Lich. Brit. p. 102; Leight. Lich. Fl. p. 398; ed. 3, p. 421. *Sphæria gregaria* Weigel Obs. Bot. p. 43, t. 2, fig. 10 (1772). Dicks. Pl. Crypt. i. p. 22 (1785); With. Arr. ed. 3, iv. p. 391; Sow. Engl. Fung. iii. t. 375, f. 5. *Spiloma* (?) *tumidula* Ach. Meth. 1, p. 11, t. 1, fig. 5 (1803) and *S. tumidulum* Ach. Lich. Univ. p. 136 (1810); Engl. Bot. t. 2151; Hook. Fl. Scot. ii. p. 35; S. F. Gray Nat. Arr. i. p. 480. *S. gregarium* Turn. & Borr. Lich. Brit. p. 42 (1839); Hook. in Sm. Engl. Fl. v. p. 167 pro parte; Tayl. in Mackay Fl. Hib. ii. p. 77 pro parte. *Coniocarpon cinnabarinum* DC. Fl. Franc. ii. p. 323 (1805); Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 443, t. 8, f. 40 (1854).

Well distinguished by the form and septation of the spores and also frequently by the red colouration which is more or less apparent on thallus or apothecia, becoming more pronounced in var. *kermesina* and disappearing in vars. *pruinata* and *anerythrea*. The thallus is usually suborbicular in outline and limited by a rather broad dark line.

Hab. On the bark of trees.—*Distr.* Frequent in England and Ireland.—*B. M.* Hassock's Gate, Crawley, Fairlight, Hurstpierpoint and Balcombe, Sussex; Oakley Park, Cirencester, Gloucestershire; Malley, New Forest, Hants; Gopsal, Leicestershire: Forden, near Welshpool, Montgomeryshire; Patcham, Worcestershire; Cliffrigg and near Stokesley, Cleveland, Yorkshire; Windermere, Westmoreland; Muckruss Demesne and Deer Park, Killarney, Kerry; Adare and near Limerick; Glenstale, Tipperary; Dromoland, Clare; Ballyedmond Glen, Cork.

Var. **astroidea** Mudd Man. p. 250 (1861), emend.—Thallus usually thin, smooth or minutely cracked, whitish or tinged with purple. Apothecia subimmersed, depressed, confluent in radiate

or stellate groups, naked or often vermilion-powdered at the margins.—*Coniocarpon cinnabarinum* var. *astroideum* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 445 (1854) pro parte. *Arthonia cinnabarina* var. *anerythrea* f. *astroidea* Leight. Lich. Fl. p. 400 (1871); ed. 3, p. 422; var. *kermesina* f. *marginata* Leight. *ll. c.* pro parte; var. *opegraphina* Leight. in Grevillea i. p. 59, t. 4, f. 7 (1872) & Lich. Fl. ed. 3, p. 423. *A. radiata* var. *opegraphina* Ach. Lich. Univ. p. 669 (1810). *A. astroidea* var. *opegraphina* Ach. Syn. p. 6 (1814); Cromb. Lich. Brit. p. 103; var. *epipastoides* Leight. *ll. c.* (non Nyl.).

Exsicc. Mudd nos. 233 (as var. *marginata*), 234.

Perhaps only a growth form. The narrow edge of bright red granules round the ardellæ is very striking in nearly all the specimens.

Hab. On trees.—*Distr.* Somewhat rare in S. and N. England and S. Ireland.—*B. M.* Withiel and St. Breock, Cornwall; Oakley Park, Cirencester, Gloucestershire; Airyholme and Ayton, Cleveland, Yorkshire.

Form **cuspidans** A. L. Sm.—Thallus as in the variety. Apothecia elongate, slender, the ends pointed, scarcely tinged with red; spores rather smaller, 0,016–19 mm. long, 0,005–7 mm. thick.—*Arthonia cinnabarina* f. *cuspidans* Nyl. in Flora lix. p. 310 (1876); Cromb. in Grevillea v. p. 30; Leight. Lich. Fl. ed. 3, p. 423.

Exsicc. Larb. Lich. Hb. n. 235.

Hab. On trees.—*Distr.* Rare in S. and W. Ireland.—*B. M.* Cromaglown, Killarney and Glencar, Kerry; Doughruagh Mt. and Derryclare, Connemara, Galway.

Var. **kermesina** A. L. Sm.—Thallus whitish or tinged red or purple. Apothecia usually convex, powdery, more or less vermilion-coloured.—Vars. *cinnabarina*, *rosacea*, *detrita* and *dubia* Mudd Man. p. 249 (*Spiloma gregarium* vars. Turn. & Borr. *l. c.*). *Coniocarpon cinnabarinum* vars. Leight. *l. c.* *A. cinnabarina* var. *kermesina* Nyl. Lich. Scand. p. 257 (1861); Cromb. Lich. Brit. p. 102; Leight. Lich. Fl. p. 399; ed. 3, p. 422, incl. ff. *cinnabarina*, *rosacea*, *detrita* and *dubia*. *Spiloma tumidulum* Sm. Engl. Bot. t. 2151 (1810) (non Ach.?). *Lepra kermesina* Schær. Enum. p. 240 (1850).

Exsicc. Leight. nos. 249, 250.

Differs from the type in the marked vermilion or purple colour. The thallus varies from whitish to a deep purple; the apothecia are usually a deep red, and occasionally thallus or apothecia somewhat whitish-pruinose.

Hab. On trunks of trees.—*Distr.* More or less common throughout the British Isles.—*B. M.* Rozel, Jersey; St. Breock, Cornwall; near Becky Falls, near Lustleigh and Torquay, Devon; Chedworth Woods, Gloucestershire; New Forest, Hants; Ardingly, Sussex; Epping Forest, Essex; Twycross, Leicestershire; Hay Park, Ludlow, Shropshire; Forden, Montgomeryshire; King's Wood, Airyholme Wood, Ingleby Park and near Ayton, Cleveland, Yorkshire; Nannau,

Dolgelley, Merioneth; Falls of Clyde, Lanarkshire; Barcaldine, Argyll; Dunkeld, Perthshire; Old Dromore and Cromaglown, Killarney, Kerry; Dromoland, Clare; Adare, Limerick; Shane's Castle, Antrim.

Var. **pruinata** A. L. Sm.—Thallus whitish, sometimes furfuraceous. Apothecia blackish, covered with a white pruina.—Vars. *concolor* and *microstigma* Mudd Man. pp. 249 & 250 (1861). *Spiloma gregarium* vars. *concolor* and *microstigma* Turn. & Borr. *l. c.* *Coniocarpon cinnabarinum* vars. *concolor* and *microstigma* Leight. *l. c.* *Arthonia cinnabarina* var. *pruinata* Del. ex Nyl. Lich. Scand. p. 257 (1861); Cromb. Lich. Brit. p. 102; Leight. Lich. Fl. p. 399; ed. 3, p. 422 incl. ff. *concolor* and *microstigma*.

Exsicc. Leight. n. 251.

The white powdery apothecia are often arranged in a stellate form, sometimes they are solitary and depressed (var. *microstigma*), when the thallus also is white suffused it is var. *concolor*.

Hab. On trees in S. and N. England and in S.W. Ireland.—*B. M.* Shanklin, I. of Wight; near Becky Falls, Devon; near Lyndhurst, New Forest; St. Leonard's Forest, Sussex; near Dorking, Surrey; Twycross, Leicestershire; Easby Wood, Airyholme Wood and Kildale, Cleveland, Yorkshire; Eagle's Nest, Killarney, Kerry.

Var. **anerythrea** A. L. Sm.—Thallus whitish. Apothecia brownish-black, prominent, naked.—*Arthonia cinnabarina* var. *anerythrea* Nyl. *l. c.*; Cromb. Lich. Brit. p. 102; Leight. Lich. Fl. p. 400; ed. 3, p. 423.

Differs from the species and the other varieties in the round prominent apothecia without any pruina.

Hab. On trees.—*Distr.* Rare in S. England and in S. and W. Ireland.—*B. M.* Near Becky Falls, Devon; near Lyndhurst, New Forest, Hants; Castle Bernard and Crosshaven, Cork; Glencar, Kerry.

5. **A. astroidestera** Nyl. in Flora lvii. p. 13 (1874).—Thallus white or cream-coloured, thin, smooth. Apothecia dark-brown, innate, slender, elongate, radiate or stellate; spores 3–5-septate (usually 4-septate), colourless, 0,021–26 mm. long, 0,007–8 mm. thick; hymenial gelatine blue with iodine.—Cromb. in Journ. Bot. xii. p. 149 (1874); Leight. Lich. Fl. ed. 3, p. 424. *A. armoricana* Cromb. Lich. Brit. p. 103 (1870) (non Nyl.); Leight. Lich. Fl. p. 401. *A. punctiformis* Mudd Man. p. 247 (1861) pro parte ? (non Ach.).

The specimens collected by Larbalestier and Crombie, now in the British Museum, have 4-celled spores, the upper cell being larger than the others, and resembling the spores of *A. gregaria*; the apothecia are partly white-suffused, and have no trace of the red-colouring matter usually to be found in that species. Mudd describes the spores of his *A. punctiformis* as 3-septate, the upper cell largest.

Hab. On holly or beech.—*Distr.* Rare in S. England and S. Ireland.—*B. M.* Lyndhurst, New Forest, Hants.

6. **A. elegans** Ach. Lich. Univ. p. 135, t. 1, fig. 1 (1810) emend.; Almqu. in K. Svensk. Vet.-Akad. Handl. xvii. n. 6, p. 19.—Thallus whitish, thin. Apothecia dark-coloured, ochraceous-pruinose, roundish or somewhat difform; spores obovate, 3-septate, upper cell largest, 0,015–18 mm. long, 0,007–8 mm. thick.—*A. ochracea* Duf. in Journ. Phys. lxxxvii. p. 205 (1818); Carroll in Journ. Bot. iii. p. 291 (1865); Cromb. Lich. Brit. p. 102; Leight. Lich. Fl. p. 394; ed. 3, p. 418.

Differs from *A. gregaria* in the apothecia and in the smaller spores. Almquist fails to note that the spores as figured by Massalongo (*Coniocarpon ochraceum* Ric. Lich. p. 47, f. 83) have the upper cell largest, as in *A. gregaria;* in the specimen from Glencar they correspond with Massalongo's figure, and measure 0,015–17 mm. long and 0,003–4 mm. thick.

Hab. On trees.—*Distr.* Rare in Wales and S. Ireland.—*B. M.* Glencar, Kerry.

§ ii. EUARTHONIA A. Zahlbr. in Engler & Prantl Nat. Pflanzenf. i. 1*, p. 90 (1903).

Algal cells *Trentepohlia.* Apothecia blackish; spores 1- or more-septate.

Spores 1-septate.

7. **A. aspersella** Leight. in Grevillea i. p. 60, t. 4, f. 4 (1872).—Thallus in patches, effuse, pale yellowish. Apothecia very minute, scattered, punctiform, linear, angular, sometimes confluent, blackish-brown, hymenium K−; spores obovate, colourless, 1-septate, 0,014 mm. long, 0,0055 mm. broad.—Leight. Lich. Fl. ed. 3, p. 415.

Somewhat similar to *A. didyma*, but differs in the darker-coloured, angular apothecia, the somewhat smaller spores, and in the hymenial reaction with potash.

Hab. On holly.—*Distr.* Rare in Wales.—*B. M.* Capel Arthog, Merioneth; Gwydir Woods, Bettws-y-Coed and Trefriw, Carnarvonshire.

8. **A. galactites** Duf. in Journ. Phys. lxxxvii. p. 203 (1818).—Thallus white, thin, smooth. Apothecia small, dark-brown, punctiform, round or oblong; spores colourless, ovate-oblong, 1-septate, 0,012–14 mm. long, 0,004 mm. thick; hymenial gelatine blue then sordid-wine-red with iodine.—*A. punctiformis* var. *galactina* (errore pro *galactites*) Ach. Lich. Univ. p. 141 (1810); *Verrucaria galactites* DC. Fl. Franc. v. p. 315 (1805).

Distinguished by the white thallus. The spores are rather broad above, the lower cell tapering downwards.

Hab. On trees.—*Distr.* Rare in S. and N. England.—*B. M.* Torquay, Devon; Lymington, Hants; Hatfield Peverel, Essex; near Ayton, Cleveland, Yorkshire.

9. **A. dispersa** Nyl. Lich. Scand. p. 261 (1861).—Thallus forming pale spots, limited but without a dark outline. Apothecia small, slender, somewhat elongate, irregular and flexuose; epithecium dark-brown; spores rather small, ovate-oblong, 1-septate, the upper cell somewhat broader, 0,010–13 mm. long, 0,004–5 mm. thick; hymenial gelatine blue then violet-coloured with iodine.—*Opegrapha dispersa* Schrad. in Ust. Ann. Bot. xxii. p. 86 (1797) fide Nyl.

Hab. On bark of trees.—*Distr.* Rare in S. England.—*B. M.* New Forest, Hants; Handcross, Sussex.

10. **A. excipienda** Cromb. Lich. Brit. p. 104 (1871).—Thallus greyish or whitish, determinate. Apothecia slender, elongate punctiform or irregular; spores colourless, obovate, 1-septate, 0,014–21 mm. long, 0,005–9 mm. thick; hymenial gelatine wine-red with iodine.—Leight. Lich. Fl. p. 393; ed. 3, p. 416. *A. dispersa* subsp. *excipienda* Nyl. Lich. Scand. p. 261 (1861). *A. hibernica* Nyl. in Flora lix. p. 237 (1876); Cromb. in Grevillea v. p. 28; Leight. Lich. Fl. ed. 3, p. 418.

Exsicc. Larb. Lich. Hb. n. 194 (as *A. hibernica*).

Perhaps only a subspecies of the preceding, but distinguished by the constantly larger spores and the different reaction with iodine.

Hab. On bark of trees.—*Distr.* Rare in Central Scotland and in S. and W. Ireland.—*B. M.* Killin, Perthshire; Mangerton, Kerry; Killery Bay and near Leenane and Cloghan, Connemara, Galway.

11. **A. punctilliformis** Leight. in Trans. Linn. Soc. ser. 2, i. p. 146, t. 22, figs. 26–28 (1876).—Thallus a mere film. Apothecia scattered, blackish-brown, very minute, irregularly roundish, convex, internally brown; spores oblong-clavate, pale-brownish, 1-septate, large, 0,029 mm. long, 0,013 mm. thick.—Leight. in Grevillea iii. p. 113 & Lich. Fl. ed. 3, p. 417; Cromb. in Journ. Bot. xiii. p. 141 (1875). Specimen not seen.

Hab. On holly.—*Distr.* Very rare in N. Wales (Trefriw, Carnarvonshire).

Spores 3–6-septate, upper cell largest.

12. **A. aspersa** Leight. in Ann. Mag. Nat. Hist. ser. 2, xviii. p. 332, t. 11, figs. 11–15 (1856).—Thallus thin, smooth, indeterminate, greyish-green. Apothecia small, roundish or irregular or substellate, the disc black, flattened or somewhat convex; spores obovate, 3-septate, colourless or pale-yellowish, the upper cell largest, 0,013–15 mm. long, 0,005–6 mm. thick; hymenial gelatine bluish with iodine.—Mudd Man. p. 248, t. 4, f. 97; Cromb. Lich. Brit. p. 102; Leight. Lich. Fl. p. 395; ed. 3, p. 418.

Exsicc. Leight. n. 248.

Differs from *A. radiata* in the less stellate apothecia, and in the septation and size of the spores.

Hab. On bark of holly.—*Distr.* Rare in England and S. Ireland.

—*B. M.* Becky Falls, Devon; Barmouth, Merioneth; Pontesbury, Shropshire; Baysdale, Cleveland and Farndale, Yorkshire; Dinish, Killarney, Kerry.

13. **A. arthonioides** A. L. Sm.—Thallus rather thick, cream-coloured slightly tinged with rose, effuse, smooth becoming pulverulent. Apothecia small, numerous, solitary or rarely confluent, rounded, somewhat convex, immarginate, the disc rough and pulverulent when old; spores 6–8 in the ascus, linear-clavate, 3-septate, the upper cell slightly larger, 0,013–16 mm. long, 0,006–7 mm. thick; hymenial gelatine yellowish-red with iodine.—*A. trachylioides* Nyl. in Mém. Soc. Sci. Nat. Cherb. iv. p. 99 (1856); Mudd Man. p. 251, t. 4, f. 98; Cromb. Lich. Brit. p. 104; Leight. Lich. Fl. p. 398; ed. 3, p. 421. *Lecidea arthonioides* Ach. Lich. Univ. p. 178 (1810).

Exsicc. Mudd n. 237.

Hab. On rocks.—*Distr.* Rare in subalpine or mountainous districts.—*B. M.* Great Orme's Head, Carnarvonshire; Ingleby and Highcliff, Cleveland, Yorkshire.

14. **A. dendritica** A. L. Sm.—Thallus whitish or greyish, effuse, tartareous, rather thick in places, smooth. Apothecia black, innate, roundish or somewhat elongate and irregularly radiate, contiguous and confluent or solitary, plane, internally pale; asci pyriform; spores obovate, or clavate, colourless, 2–4-septate, upper cell largest, 0,017–22 mm. long, 0,005–7 mm. thick. —*Stigmatidium dendriticum* Leight. in Journ. Bot. xiii. p. 257, t. 166 (1875) & Lich. Fl. ed. 3, p. 413.

Exsicc. Larb. Lich. Hb. n. 192.

Resembles *Enterographa* in the grouping of the apothecia, but is separated from that genus by the form and structure of asci and spores.

Hab. On rocks.—*Distr.* Very rare in W. Ireland.—*B. M.* Tully and Doughruagh Mt., Connemara, Galway (the only localities).

15. **A. ilicina** Tayl. in Mackay Fl. Hib. ii. p. 105 (1836).—Thallus cream-coloured, thin, smooth, shining, limited by a brownish border varying in width. Apothecia small, scattered, subimmersed, irregularly round or oblong, blackish-brown, plane; spores colourless or pale yellow, obovate-clavate, 6-septate, the upper cell largest, 0,021–36 mm. long, 0,009–12 mm. thick; hymenial gelatine blue, the asci yellowish or wine-red, with iodine.—Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 441, t. 8, f. 36 (1854) & Lich. Fl. p. 401; ed. 3, p. 425; Mudd Man. p. 248; Cromb. Lich. Brit. p. 102. *A. ilicinella* Nyl. in Flora l. p. 179 (1867); Carroll in Journ. Bot. v. p. 259 (1867); Cromb. *l. c.* Leight. Lich. Fl. *ll. c.* *A. subexcedens* Nyl. in Flora lxii. p. 221 (1879); Cromb. in Grevillea viii. p. 29.

Exsicc. Cromb. n. 196; Larb. Lich. Hb. nos. 154, 277 (as *A. subexcedens*).

Hab. On holly.—*Distr.* Rare in S. England and in S. and W. Ireland.—*B. M.* Withiel, Cornwall; Ivybridge, Devon; New Forest, Hants; Eridge Park, Essex; St. Leonard's Forest, Sussex; Glenbower Wood, Cork; near Derrycurrihy, Cromaglown, Croghan and Torc Mt., Killarney, Kerry; Ballynahinch, Lough Inagh and Kylemore, Connemara, Galway.

Spores 3–5-septate, cells equal in size.

16. **A. cascarillæ** Leight. Lich. Fl. p. 394 (1871); ed. 3, p. 418.—Thallus pallid-glaucous, thin. Apothecia blackish, minute, simple, plane, oblong, or linear-oblong or irregularly difform by confluence; spores elongate, colourless, 4–5 septate.—*Coniocarpon cascarillæ* Fée Ess. Crypt. p. 99, t. 15, f. 4 (1824) & Suppl. p. 94, t. 42, f. 3 (1837). Specimen not seen.

Hab. On bark.—*Distr.* Reported from Glencar, Kerry and Kylemore, Connemara, Galway, though Leighton (*ll. c.*) questions the identity of these plants. Those he examined had spores 3-septate, with a large upper cell; while Fée's figure represents 4-septate spores, the cells equal in size.

17. **A. pruinata** Steudel Nomencl. Bot. p. 267 (1824).—Thallus broadly effused, tartareous, thin whitish or pale-yellow, cracked and uneven, somewhat pulverulent (K+yellow, CaCl+rose-coloured). Apothecia brownish or lead-coloured, appressed, irregularly roundish or oblong, plane or slightly convex, rough, white-pruinose; spores linear-obovate, colourless, usually 4-, rarely 3- or 5-septate, the cells equal in size, 0,014–20 mm. long, 0,006–8 mm. thick; hymenial gelatine blue then wine-red with iodine.—*A. pruinosa* Ach. Lich. Univ. p. 147, t. 1, f. 3 (1810); S. F. Gray Nat. Arr. i. p. 480; Cromb. Lich. Brit. p. 103; Leight. Lich. Fl. p. 400; ed. 3, p. 424. *A. impolita* Borr. in Engl. Bot. Suppl. t. 2692, f. 1 (1831); Hook. in Sm. Engl. Fl. v. p. 143; Tayl. in Mackay Fl. Hib. ii. p. 104; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 440, t. 8, f. 35 (1854); Mudd Man. p. 248. *Patellaria pruinata* Pers. in Ust. Ann. Bot. vii. p. 28 (1794). *Verrucaria impolita* Hoffm. Deutschl. Fl. ii. p. 172 (1795). *Lichen impolitus* Ehrh. Crypt. n. 274 (1793) nomen; Sm. Engl. Bot. t. 981, f. 1 (1802).

Exsicc. Leight. n. 131; Larb. Lich. Hb. n. 114.

Hab. On old oaks, ivy, elm, yew and old timber.—*Distr.* Frequent in England, recorded also from Wales and Ireland.—*B. M.* Castle Hornock, Penzance, Cornwall; Lustleigh, Devon; Lyndhurst, New Forest; Shiere, Surrey; Hurstpierpoint, Sussex; Ulting, Essex; near Oaksey, Wilts; Twycross, Leicestershire; Hay Wood, Herefordshire; Ballenhall, Worcestershire; Llanrwst, Denbighshire; Oswestry, Shropshire; Ickworth Park, Suffolk; Kildare, Cleveland, Yorkshire; Bishop Auckland, Durham; Tralee, Kerry; Adare, Limerick.

18. **A. radiata** Ach. Lich. Univ. p. 144 (1810) (incl. vars.).—Thallus developed under the bark, forming whitish or greyish determinate patches, sometimes with a dark outline. Apothecia small, dark-brown, rough, innate, clustered in substellate or radiate groups, pale within, the epithecium dark-brown; spores linear-clavate, 3-septate, rounded at the ends, the cells equal in size, colourless, sometimes with a clear epispore, 0,012–20 mm. long, 0,004–6 mm. thick; hymenial gelatine blue then violet, the asci and spores wine-red, with iodine.—*A. astroidea* Ach. in Schrad. Neu. Journ. Bot. i. 3, p. 17, t. 4, f. 4 (1806) & Syn. p. 6 (1814) (excl. var. *anastomosans*); Hook. Fl. Scot. ii. p. 36; S. F. Gray Nat. Arr. i. p. 479; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 438, t. 8, f. 32 (1854) & Lich. Fl. p. 396; ed. 3, p. 419; Mudd Man. p. 246 (incl. var. *anastomosans* (non Ach.)); Cromb. Lich. Brit. p. 103 pro parte. *Opegrapha radiata* Pers. in Ust. Ann. Bot. vii. p. 29 (1794). *O. astroidea* Ach. Meth. p. 25 (1803); Engl. Bot. t. 1847. *Lichen astroites* Ach. Lich. Suec. Prodr. p. 24 (1798).

Exsicc. Baxt. Stirp. Crypt. n. 22; Mudd nos. 227, 229 (as var. *anastomosans*); Leight. n. 289; Larb. Lich. Hb. n. 112.

Hab. On smooth bark of trees in wooded regions.—*Distr.* General and common throughout the British Isles.—*B. M.* Sark; St. Breock, Cornwall; Ilsham, Torquay; Lydford, near Lustleigh and Ullacombe, Devon; Lyndhurst, New Forest, Hants; St. Leonard's, Hurstpierpoint and Glynde, Sussex; Ightham, Kent; Shiere, Surrey; Epping Forest, Hockley Woods and Ulting, Essex; Windsor Forest, Berks; Gopsall Park, Leicestershire; Malvern, Worcestershire; Edderton Wood, Montgomeryshire; Builth, Brecknockshire; Barmouth, Merioneth; Bettws-y-Coed, Carnarvonshire; near Buxton, Derbyshire; Cottishall, Norfolk; Easby Wood and Cliffrigg, Cleveland, Yorkshire; Hexham, Northumberland; near Edinburgh; Pearsie, Forfarshire; Glen Falloch, Glen Lochay, Finlarig, Killin and Aberfeldy, Perthshire; Appin and Barcaldine, Argyll; Hill of Ardo and Morrone, Braemar, Aberdeenshire; Fort William, Invernessshire; Applecross, Rossshire; Killarney, Kerry; Killaloe, Clare.

Var. **Swartziana** Sydow Flecht. Deutschl. p. 243 (1887).—Thallus whitish or olivaceous, subdeterminate. Apothecia black, plane, clustered into irregular angular sometimes elongate shapes.—*Arthonia Swartziana* Ach. in Schrad. Neu. Journ. Bot. i. 3, p. 13, t. 4, f. 1 (1806); Engl. Bot. t. 2079; S. F. Gray Nat. Arr. i. p. 479; Hook. in Sm. Engl. Fl. v. p. 143; Tayl. in Mackay Fl. Hib. ii. p. 104; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 439 (1854) & Lich. Fl. p. 397; ed. 3, p. 420 (incl. *A. astroidea* var. *simulans* Leight.). *A. astroidea* var. *Swartziana* Hepp Flecht. Eur. n. 352 (1857); Mudd Man. p. 246; Cromb. Lich. Brit p. 103.

Exsicc. Mudd n. 228; Leight. n. 70.

Differs from the species in the more compact ardellæ, which are irregular in outline rather than distinctly stellate or radiate. When

the ardellæ are somewhat innate, as it were rubbed down, it is *A. astroidea* var. *simulans* Leight. (Lich. Fl. ed. 3, p. 420).

Hab. On smooth bark of trees.—*Distr.* General and common throughout the British Isles.—*B. M.* Shanklin, I. of Wight; near Lyndhurst, New Forest, Hants; Ullacombe, near Bovey Tracey, Devon; St. Leonard's Forest, Sussex; Braydon Forest, Wilts; Hoe Street, Walthamstow, Hockley Woods and Ulting, Essex; near Worcester and Malvern, Worcestershire; Harboro' Magna, Warwickshire; near Barmouth, Merioneth; near Shrewsbury, near Wellington and near Acton Scott, Shropshire; Trefriw, Carnarvonshire; Airyholme Wood, Cleveland, Yorkshire; Teesdale, Durham; by the Falls of the Clyde, Lanarkshire; near Stirling; Ben Lawers and Finlarig, Killin, Perthshire; Appin, Argyll; Morrone, Braemar, Aberdeenshire; Askew Wood and Cromaglown, Killarney, Kerry; between Bandon and Innishannon, Cork; near Dublin; Maam Turk Mts. and Delphi, Connemara, Galway.

Var. **epipastoides** A. L. Sm.—Thallus whitish. Apothecia small, very slender, elongate, sparingly irregular; spores rather smaller than in the species.—*A. astroidea* var. *epipastoides* Nyl. Lich. Scand. p. 259 (1861); Cromb. Lich. Brit. p. 103.

The apothecia are usually minutely lirellæform, though sometimes somewhat punctiform and similar to the following species.

Hab. On smooth bark of trees.—*Distr.* Rare in the Channel Islands, S. England and S. Ireland.—*B. M.* Noirmont, Jersey; Ilsham Walk, Torquay, Devon; Eagle's Nest and Killarney, Kerry.

19. **A. punctiformis** Ach. Lich. Univ. p. 141 (1810) pro parte & Syn. p. 4 (1814).—Thallus thin, indeterminate, whitish or copper-coloured. Apothecia dark-brown, plane or slightly convex, scattered, subinnate, roundish or oblong, internally pale; spores colourless, linear-clavate, or obovate, obtuse, 3–4-septate, the cells equal in size, 0,016–24 mm. long, 0005–8 mm. thick; hymenial gelatine blue then dark, the asci wine-red, with iodine.—Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 438, t. 7, f. 31 (1854), incl. f. *galactina* Leight. *l. c.* (non Ach.) & Lich. Fl. p. 395; ed. 3, p. 419; Mudd Man. p. 247 pro parte; Cromb. Lich. Brit. p. 104. *A. epipasta* var. *β microscopica* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 436, t. 7, f. 30 (1854) pro parte. *Opegrapha epipasta* Hook. in Sm. Engl. Fl. v. p. 144 pro parte (non Ach.); Engl. Bot. t. 1828?; Tayl. in Mackay Fl. Hib. ii. p. 105. *Hysterina epipasta* S. F. Gray Nat. Arr. i. p. 506 (1821)?

Closely allied to *A. radiata*, differing chiefly in the less determinate thallus and the smaller usually punctiform apothecia.

Hab. On smooth bark of trees.—*Distr.* Somewhat rare in S. England and W. Ireland.—*B. M.* New Forest, Hants; near Kylemore and Doughruagh Mt., Connemara, Galway.

Var. **melantera** Leight. Lich. Fl. p. 396 (1871).—Thallus somewhat darker-coloured than in the species. Apothecia rather elongate, slender, spores as in the species.—Leight. Lich. Fl.

ed. 3, p. 419. *A. obscura* var. *melantera* Ach. Syn. p. 7 (1814). *A. epipasta* Mudd Man. p. 247 (1861) (non Koerb.) (spore measurements incorrect); Leight. Lich. Fl. p. 397; ed. 3, p. 420 (spore measurements too large). *A. astroidea* var. *epipasta* Nyl. in Mém. Soc. Sci. Nat. Cherb. v. p. 133 (1857); Cromb. Lich. Brit. p. 103. *Opegrapha microscopica* Sm. Engl. Bot. t. 1911 (1808). *Hysterina microscopica* S. F. Gray Nat. Arr. i. p. 506 (1821)?

Exsicc. Mudd n. 230 (as *A. epipasta*).

Distinguished from the species by the darker, shining thallus.

Hab. On branches and trunks of trees.—*Distr.* Rare throughout the British Isles.—*B. M.* Noirmont Manor, Jersey; Newton Bushell, Devon; near Swindon, Gloucestershire; Dolgelly, Merioneth; near Welshpool, Montgomeryshire; Stableford, Shropshire; Cliffrigg and Ayton, Cleveland, Yorkshire; Banks of Garry, Blair Athole, Perthshire; Morrone, Braemar, Aberdeenshire; near Crosshaven, Cork.

20. **A. insinuata** Stirton in Trans. Glasgow Soc. Nat. 1875, p. 90.—Thallus whitish or pale, subsquamulose, very thin. Apothecia brown or brownish-black, adnate, round or oblong or somewhat irregular, at first veiled, generally with a somewhat squamulose thalline margin, internally pale; spores 4 to 8 in the ascus, colourless, sometimes slightly brownish, oblong, crenulate at the margin, spuriously and equally 4-septate, 0,014–21 mm. long, 0,006–8 mm. thick; hymenial gelatine bright-blue with iodine.—Leight. Lich. Fl. ed. 3, p. 423. Specimen not seen.

Hab. On trees. Collected by Dr. Stirton near Killiecrankie, Perthshire.

§ iii. Lecideopsis Almquist in K. Svensk. Vet.-Akad. Handl. xvii. n. 6, p. 46 (1880).

Algal cells *Palmellaceæ* or thallus wanting. Apothecia blackish; spores usually 1- rarely pluri-septate.

Spores 1-septate.

21. **A. patellulata** Nyl. in Bot. Not. 1853, p. 95.—Thallus whitish, thin, effuse. Apothecia black, small, roundish or angular, appressed, plane, blackish within; spores obovate, colourless, 1-septate, small, 0,009–15 mm. long, 0,003–5 mm. thick, the upper cell somewhat thicker, the lower longer and oblong; hymenial gelatine wine-red with iodine.—Carroll in Journ. Bot. iii. p. 291 (1865); Cromb. Lich. Brit. p. 105; Leight. Lich. Fl. p. 392; ed. 3, p. 416.

Hab. On smooth bark in wooded regions.—*Distr.* Rare in Ireland. —*B. M.* Carigogunnel, near Limerick.

22. **A. lapidicola** Branth & Rostr. in Bot. Tidssk. iii. p. 245 (1869).—Thallus dark-olive-brown, thin, furfuraceous.

Apothecia small, black, roundish, plane, blackish within; spores obovate, colourless, 1-septate, 0,011–16 mm. long, 0,005–6 mm. thick; hymenial gelatine wine-red with iodine.—Cromb. Lich. Brit. p. 105; Leight. Lich. Fl. p. 393; ed. 3, p. 416. *A. ruderalis* Nyl. in Mém. Soc. Sci. Nat. Cherb. iv. p. 100 (1856); Carroll in Journ. Bot. iv. p. 24 (1866). *A. fusca* Hepp Flecht. Eur. n. 534 (1860). *Lecidea lapidicola* Tayl. in Mackay Fl. Hib. ii. p. 124 (1836).

Exsicc. Leight. n. 398 (as *A. fusca*).

Hab.—On calcareous rocks.—*Distr.* Somewhat rare in upland and mountainous districts of the British Isles.—*B. M.* Fairlight, Hastings, Sussex; Cirencester, Gloucestershire; near Abergavenny, Monmouthshire; Dolgelly, Merioneth; Malvern, Worcestershire; Ben Lawers, Perthshire; Dunkerron and Cappaghmore Bridge, Kerry.

Spores 3–4-septate.

23. **A. paralia** Nyl. in Flora lx. p. 565 (1877).—Thallus dark-greyish- or reddish-brown, thin, rather smooth. Apothecia dark-brown, roundish, nearly plane; colourless within; spores elongate-ovate, subconstricted in the middle, 3–4-septate, 0,018–22 mm. long, 0,007 mm. thick; hymenial gelatine wine-red with iodine.—Cromb. in Grevillea vi. p. 111; Leight. Lich. Fl. ed. 3, p. 421.

Exsicc. Larb. Lich. Hb. n. 113.

Hab. On maritime rocks.—*B. M.* Cloghan, Connemara, Galway (the only locality).

24. **A. myriocarpella** Nyl. in Ann. Sci. Nat. sér. 4, xx. p. 238 (1863).—Thallus pale-ashy-grey, effuse, thin, subareolate or subpulverulent, sometimes evanescent. Apothecia minute, brownish-black, roundish, plane or convex, blackish within; spores oblong-ovoid, colourless, 3-septate, 0,010–12 mm. long, 0,003–4 mm. thick.—Carroll in Journ. Bot. iii. p. 292 (1865); Cromb. Lich. Brit. p. 104; Leight. Lich. Fl. p. 394; ed. 3, p. 418. Specimen not seen.

Hab. On mica-schist rocks, collected at Aviemore, Elginshire.

Parasitic on other Lichens.

25. **A. varians** Nyl. Lich. Scand. p. 260 (1861).—Thallus none. Apothecia dull-black, rounded, scattered or confluent, plane or somewhat convex, roughish, internally pale-brown; spores oblong, usually 3-, sometimes 1- or 2-septate, colourless, 0,012–18 mm. long, 0,006–8 mm. thick; hymenial gelatine usually blue then wine-red with iodine.—Cromb. Lich. Brit. p. 104; Leight. Lich. Fl. p. 402; ed. 3, p. 426. *A. glaucomaria* Nyl. in Mém. Soc. Sci. Nat. Cherb. iv. p. 98 (1856); Leight. in Ann. Mag. Nat. Hist. ser. 2, xviii. p. 330 (1856); Carroll in

Nat. Hist. Rev. vi. p. 532 (1859). *A. parasemoides* Nyl. *l. c.*; Mudd Man. p. 251. *Lichen varians* Davies in Trans. Linn. Soc. ii. p. 284, t. 28, f. 3 (1794).

Exsicc. Baxt. Stirp. Crypt. n. 47; Mudd n. 238 (as *A. parasemoides*); Leight. n. 247 (as *A. glaucomaria*); Larb. Lich. Hb. n. 155; Cromb. n. 99.

Hab. Parasitic on the apothecia of *Lecanora glaucoma*, destroying the hymenium. Also recorded by Carroll (*l. c.*) on the apothecia of *Urceolaria scruposa*.—*Distr.* Chiefly in mountainous and maritime regions.—*B. M.* Noirmont and La Moze, Jersey; Guernsey; Sark; Newlyn Cliff, Penzance, and St. Minver, Cornwall; Barmouth, Merioneth; Long Mynd, Shropshire; Pwllheli, Carnarvonshire; Ayton, Cleveland, Yorkshire; Milnthorpe, Westmoreland; Portlethen, Kincardineshire; Appin, Argyll; Craig Guie, Braemar, Aberdeenshire; Lambay Island, Dublin.

26. **A. subvarians** Nyl. in Flora li. p. 345 (1868).—Thallus none. Apothecia minute, scattered or confluent, blackish-brown, more or less convex; spores oblong-ovoid, colourless, becoming brownish when old, 1-septate, 0,011–13 mm. long, 0,004–5 mm. thick; hymenial gelatine dark-dingy-brown with iodine.—*A. galactinaria* Leight. Lich. Fl. ed. 3, p. 426 (1879).

Hab. Parasitic on the apothecia of *Lecanora galactina*.—*Distr.* Rare in S. England.—*B. M.* Glynde, Sussex; near Cirencester, Gloucestershire.

27. **A. punctella** Nyl. ex Carroll in Nat. Hist. Rev. vi. p. 532 (1859).—Thallus none. Apothecia minute, black, innate scattered; spores oblong-clavate, colourless, brownish, 1-septate, the upper cell largest; 0,015 mm. long, 0,006 mm. thick.—Mudd Man. p. 252; Cromb. Lich. Brit. p. 105; Leight. Lich. Fl. p. 403; ed. 3, p. 426.

Easily distinguished from the host by the minute size of the apothecia.

Hab.—Parasitic on the thallus of *Rhizocarpon alboatrum*.—*B. M.* Queenstown, near Cork (the only locality).

28. **A. peltigerea** Th. Fr. in Bot. Not. 1866, p. 15.—Thallus none. Apothecia rather large, orbicular, somewhat convex, appressed, black; hypothecium thick, dark-brown; paraphyses distinct, stout; spores oblong or ovate-oblong, 0,015–22 mm. long, 0,006–8 mm. thick; hymenial gelatine deep-wine-red with iodine.

Hab.—Parasitic on the thallus of *Peltigera* and *Solorina saccata*.—*B. M.* On the thallus of *Peltigera spuria* on wall tops, Corriemulzie, Braemar, Aberdeenshire.

84. **ARTHOTHELIUM** Massal. Ric. Lich. p. 54 (1852) emend.; Mudd Man. p. 252. (Pl. 21.)

Thallus crustaceous, uniform. Algal cells *Trentepohlia*. Apo-

thecia innate, immarginate, roundish or somewhat elongate and irregular; asci ovate-pyriform, thickened at the apices; spores ovate-elliptical, septate then muriform, colourless or brownish; paraphyses indistinct, branched, coherent.

With the general characters of *Arthonia*, but differing in the muriform spores.

1. **A. dispersum** Mudd Man. p. 252, t. 4, f. 99 (1861).—Thallus greyish-white or cream-coloured, thin, membranaceous, smooth. Apothecia small, innate, plane, simple or minutely radiate, congregate in small groups, brownish-black; spores oblong, muriform, colourless, 0,021–27 mm. long, 0,010–15 mm. thick; hymenial gelatine blue, the asci wine-red, with iodine.—*Opegrapha dispersa* DC. Fl. Franc. p. 308 (1805) pro parte (fide Nyl. in Mém. Soc. Sci. Nat. Cherb. iv. p. 93 (1856)). *Arthonia dispersa* Duf. in Journ. Phys. lxxxvii. p. 203 (1818); Carroll in Nat. Hist. Rev. vi. p. 532 (1859). *A. anastomosans* Cromb. Lich. Brit. p. 103 (1870); Leight. Lich. Fl. p. 402; ed. 3, p. 425. *A. radiata* var. *anastomosans* Ach. Lich. Univ. p. 146 (1810).

Hab. On the smooth bark of trees, chiefly young oaks and hazel.—*Distr.* Rare in S. England and S. Ireland.—*B. M.* Near Ullacombe, Bovey Tracey, Devon; near Bantry Bay, Cork; Torc Mt., Croghan, Old Dromore and Eagle's Nest, Killarney, Kerry.

2. **A. spectabile** Massal. Ric. Lich. p. 54 (1852).—Thallus whitish, effuse, thin, unequal, subfarinaceous. Apothecia brownish-black, rather large, angularly roundish, often surrounded by a spurious thalline margin, scattered or crowded and subconfluent, internally dark-coloured; spores oblong, septate, muriform, colourless, becoming brown, 0,030–36 mm. long, 0,015 mm. thick; hymenial gelatine usually blue then wine-red with iodine.—*Arthonia spectabilis* Flot. ex Massal. *l. c.*; Carroll in Journ Bot. vi. p. 100 (1868); Cromb. Lich. Brit. p. 103; Leight. Lich. Fl. p. 402; ed. 3, p. 425.

Hab. On trees.—*Distr.* Rare in S. England, Wales and S. Ireland.—*B. M.* Dartmoor, Devon; Dolgelly, Merioneth, Croghan, Killarney, Derry.

GRAPHIDACEÆ.

Thallus crustaceous. Algal cells *Trentepohlia*, or rarely *Palmella*. Apothecia usually linear (*lirellæ*), rarely oblong or oval, simple or branched, sessile or erumpent, marginate; paraphyses simple or branched; asci elongate-clavate, spores simple or variously septate or muriform, colourless or coloured.

The more distinctly elongate apothecia, which have a well-developed proper margin, distinguish *Graphidaceæ* from the two

preceding Natural Orders. It is represented in Britain by the following genera:—

Thallus with *Palmella* gonidia; apothecia oblong or oval.
- Spores simple, colourless.
  - Hymenium simple.
    - Apothecia carbonaceous ..... 85. **Lithographa.**
    - ,, not carbonaceous ... 86. **Xylographa.**
  - Hymenium compound ..... 87. **Ptychographa.**
- Spores 1-septate, brown..... 88. **Encephalographa.**

Thallus with *Trentepohlia* gonidia; apothecia elongate or roundish.
- Spores 1-septate, colourless or brown ... 89. **Melaspilea.**
- Spores 3-pluri-septate.
  - Apothecia superficial ..... 90. **Opegrapha.**
  - Apothecia immersed.
    - Spores colourless..... 91. **Graphis.**
    - Spores brown ..... 92. **Phæographis.**
- Spores muriform ..... 93. **Graphina.**

85. **LITHOGRAPHA** Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 393 (1856). (Pl. 22.)

Thallus crustaceous, sometimes evanescent. Algal cells *Palmella*. Apothecia shortly elongate, lirelliform, carbonaceous, the disc usually narrow, the margins prominent, inflexed; hypothecium usually dark-coloured; paraphyses very rarely discrete; asci clavate, 8- or poly-spored; spores simple, colourless.

1. **L. tesserata** Nyl. tom. cit. p. 441 & Lich. Scand. p. 290.—Thallus thickish, verrucose-areolate or areolate-rimose, greyish, pale-greyish-brown or whitish (K + yellow then reddish, CaCl−). Apothecia moderate in size, rather prominent, shortly lirelliform, obtuse, simple or at times divided, black, the margin somewhat shining; disc narrow; paraphyses irregular or indistinct; hypothecium thick, blackish-brown; spores 8 in the ascus, oblong or ellipsoid, 0,008–15 mm. long, 0,005–8 mm. thick; hymenial gelatine pale-bluish then tawny-wine-red with iodine.—Mudd Man. p. 225, t. 4. fig. 87; Cromb. Lich. Brit. p. 95; Leight. Lich. Fl. p. 360; ed. 3, p. 393. *Opegrapha tesserata* DC. Fl. Franc. ii. p. 313 (1805); Borr. Engl. Bot. Suppl. t. 2632, f. 2; Hook. in Sm. Engl. Fl. v. p. 146; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 88, t. 5, f. 1 (1854).

Exsicc. Leight. n. 396.

The thalline areolæ are either contiguous or somewhat scattered, the black hypothallus being more or less visible. The apothecia, variable in form, are either solitary or crowded and congested.

Hab. On rocks from upland to alpine situations in mountainous regions. *Distr.* With certainty only in N. Wales, N. England, on the Grampians, and in the N.W. Highlands of Scotland.—*B. M.* Near Lyn Aran and Cader Idris, Merioneth; Capel Curig, Cwm Clyd, Nant Francon, Snowdon, Carnarvonshire; near Stavely, Kendal, Westmoreland; Holwick Scar, Teesdale, Durham; Ben Lawers, Perthshire; summit of Morrone, Braemar, Aberdeenshire; Hills of Applecross, Rossshire.

2. **L. flexella** A. Zahlbr. in Engler & Prantl Nat. Pflanzenf. i. 1*, p. 93 (1903).—Thallus effuse, thin, whitish, or nearly obsolete (K−, CaCl−). Apothecia superficial, minute, black, oblong or angular, the disc narrow and slit-like or irregularly dilated; hypothecium brown or blackish-brown; paraphyses not well discrete, dark at the apices; spores 8 in the ascus, ovoid or ellipsoid, minute, 0,004–6 mm. long, 0,002–3 mm. thick; hymenial gelatine bluish then sordid-wine-red with iodine.—*Limboria flexella* Ach. in Vet. Acad. Handl. 1815, p. 258. *Xylographa flexella* Fr. Summa Veg. Scand. p. 372 (1849); Nyl. in Mém. Soc. Sci. Nat. Cherb. v. p. 128 (1857); Cromb. in Journ. Bot. xiv. p. 362 (1876); Leight. Lich. Fl. ed. 3, p. 392.

An aberrant species, allied to *Xylographa*, but with a dark carbonaceous hypothecium.

Hab. On stumps of felled trees.—*B. M.* Oakley Park, near Cirencester, Gloucestershire.

3. **L. Andrewii** Stirton in Scott. Nat. 1878, p. 300.—Thallus indeterminate, thickish, subareolate, white or greyish-white (K −, CaCl −). Apothecia small, sessile or innate-sessile, roundish or oblong, simple or rarely divided, the margins prominent, black, the epithecium becoming applanate; hypothecium brownish; paraphyses slender, discrete; spores ellipsoid or subglobose 0,008–9 mm. long, 0,005–6 mm. thick, with a distinct epispore; hymenial gelatine not tinged, the asci tawny-yellow, with iodine.—Leight. Lich. Fl. ed. 3, p. 394.

The apothecia in the single specimen seen are crowded; Stirton states that they are albo-velate in a young state.

Hab. On a granitic rock in an upland hilly district.—*B. M.* Cairn Edward, New Galloway, Kircudbrightshire (the only locality).

4. **L. dendrographa** Nyl. in Flora xlvii. p. 448 (1864).—Thallus effuse, very thin, greyish (K −, CaCl −), subevanescent. Apothecia erumpent, linear, oblong or elliptical, simple or slightly divided-furcate, black, concolorous within; epithecium narrow, becoming applanate; paraphyses slender, irregular, not well discrete; hypothecium brownish-black; ascus polyspored; spores ellipsoid, 0,005–8 mm. long, 0,003–4 mm. thick; hymenial gelatine wine-red with iodine.—Cromb. Lich. Brit. p. 95; Leight. Lich. Fl. p. 361; ed. 3, p. 393.

In the British specimens the thallus is usually but little visible, and becomes at length quite obsolete. The apothecia are numerous and crowded, though at times somewhat scattered. When these are simple the plant has very much the external aspect of a *Hysterium*.

Hab. On the trunks of old trees in maritime and upland tracts. *Distr.*—Rather local and scarce in S. and S.W. England.—*B. M.* Near Sidmouth, Cockington, near Torquay and the Dart, Devon; Swanage, Dorset; Whitefield, I. of Wight.

5. **L. petræa** Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 393 (1856).—Thallus obsolete. Apothecia linear, simple, black, slightly shining, gregarious, often somewhat flexuose; margins tumid; disc narrow; hypothecium thick, black; paraphyses very slender, somewhat branched; ascus polyspored; spores very minute, 0,003–4 mm. long, 0,001 mm. thick; hymenial gelatine pale-bluish, then wine-red with iodine.—Cromb. Lich. Brit. p. 95, Leight. Lich. Fl. p. 360; ed. 3, p. 393. *Opegrapha petræa* Dur. Expl. Sci. Algér. p. 278 (1846) (excl. syn.) (non Ach.).

Exsicc. Larb. Cæsar. n. 40.

Not to be confounded with *Lecanora simplex*, to states of which it bears considerable resemblance, but differs in the lirelliform, congregate apothecia and the black hypothecium. The thallus is indicated merely by a rudimentary dark hypothallus.

Hab. On rocks, in maritime districts.—*Distr.* Found only in the Channel Islands and W. Ireland; no doubt to be detected elsewhere. —*B. M.* Le Fret, Noirmont and La Moye, Jersey; near Kylemore and Lettermore, Galway.

86. **XYLOGRAPHA** Fr. Summa Veg. Scand. p. 372 (1849) pro parte; Nyl. in Mém. Soc. Sci. Nat. Cherb. iii. p. 187 (1855). (*Stictis* § *Xylographa* Fr. Syst. Myc. ii. p. 197 (1823) emend.) (Pl. 23.)

Thallus developed under the bark (hypophlœodal). Algal cells *Palmella*. Apothecia innate or erumpent, lirelliform, not carbonaceous, roundish-oblong or irregular; the disc plane or concave; hypothecium usually pale; paraphyses slender; spores 8 in the ascus, simple, colourless; spermogones with simple sterigmata and acicular curved spermatia.

Differs from *Lithographa* in the plane or concave apothecia and in the colourless or pale hypothecium.

1. **X. parallela** Fr. Summa Veg. Scand. p. 372 (1849).—Thallus forming elongate whitish spots or little visible (K−, CaCl−). Apothecia innate, erumpent, black, narrowly linear, straight, developed in parallel rows, at first concave with slightly elevated margin, becoming plane and immarginate; hypothecium colourless; paraphyses discrete, brownish at the apices; spores ellipsoid, 0,011–16 mm. long, 0,005–7 mm. thick; hymenial gelatine bluish then violet-coloured with iodine.—Cromb. Lich. Brit. p. 95; Leight. Lich. Fl. p. 362; ed. 3, p. 391. *Lichen parallelus* Ach. Lich. Suec. Prodr. p. 23 (1798). *Stictis parallela* Fr. Syst. Myc. ii. p. 197 (1822); Hook. in Sm. Engl. Fl. v. 2, p. 213 (1836); Cooke Brit. Fung. p. 736 pro parte.

Exsicc. Cromb. n. 96.

Easily recognized by the peculiar arrangement of the fructification. In the British specimens the thallus is but seldom distinct, being

indicated merely by scattered gonidia among the fibres of the substratum.

Hab. On old fir palings in upland tracts of mountainous districts. —*Distr.* Seen only from among the Grampians, Scotland, where it is not infrequent.—*B. M.* Glen Orchy, Argyll; Glen Falloch, Glen Lochay, Ben Lawers, Pass of Killiecrankie, and Glen Fender, Perthshire; Crathie, Braemar, Aberdeenshire; Rothiemurchus Woods, Invernessshire.

Var. **pallens** Nyl. in Mém. Soc. Cherb. v. p. 128 (1857).—Thallus as in the species. Apothecia rather smaller, pale or pale-brown.—Cromb. in Grevillea i. p. 173; Leight. Lich. Fl. ed. 3, p. 391.

Differs only in the paler colour of the apothecia, though at times they are here and there concolorous with those of the type.

Hab. On old fir palings in mountainous districts.—*Distr.* Found sparingly in a few localities among the S. Grampians, Scotland.—*B. M.* Achmore, Glen Lochay, Killin and Pass of Killiecrankie, Blair Athole, Perthshire.

Form **elliptica** Nyl. ex Cromb. in Journ. Bot. xi. p. 135 (1873) nomen; Leight. Lich. Fl. ed. 3, p. 391 (1879). Apothecia shorter, oblong or difform, blackish or brown.—*X. scaphoidea* Stirton in Grevillea iii. p. 35; Leight. Lich. Fl. *l. c.*

Differs in the form of the apothecia, which vary also in colour according to age and exposure.

Hab. On old palings and denudate trunks of trees in mountainous regions.—*Distr.* Here and there among the Grampians, Scotland.—*B. M.* Achmore, Killin, Ben Lawers and Pass of Killiecrankie, Perthshire: Crathie, Braemar, Aberdeenshire; Rothiemurchus, Invernessshire.

2. **X. laricicola** Nyl. in Flora lviii. p. 13 (1875).—Thallus effuse, very thin, greyish-white (K−, CaCl−), often scarcely visible. Apothecia superficial, minute, oblong or slightly flexuose, at length somewhat applanate with evanescent margin, black, opaque, within whitish; epithecium brown; paraphyses absent or abnormal (membranaceous); hypothecium brown; spores ellipsoid, 0,012–15 mm. long, 0,007–8 mm. thick; hymenial gelatine tawny-wine-coloured with iodine.—Cromb. in Grevillea iii. p. 128; Leight. Lich. Fl. ed. 3, p. 391.

Exsicc. Cromb. n. 97.

Interesting as occurring on living trees. The apothecia are somewhat irregularly scattered.

Hab. On the bark of an old larch tree, near its base, in an upland mountainous region.—*B. M.* Ben Lawers, Perthshire (the only locality).

3. **X. spilomatica** Th. Fr. Lich. Scand. p. 639 (1874).—Thallus effuse, greyish-white, thinnish, with numerous yellowish-green soredia (K−, CaCl−). Apothecia erumpent, subminute,

innate, sessile, roundish or difform, plane, reddish or sordid-yellowish-red, thinly margined; hypothecium colourless; paraphyses slender, subdiscrete, pale-brownish at the apices; spores ellipsoid, 0,008–12 mm. long, 0,004–6 mm. thick; hymenial gelatine bluish then violet with iodine.—*Agyrium spilomaticum* Anzi in Comm. Soc. Critt. Ital. ii. p. 20 (1864).

The sorediate thallus, which, as noticed by Th. Fries, is often sterile, apart from the other diagnostic characters, readily identifies the plant. The apothecia, sparingly visible in the British specimen, are either solitary or conglomerate, and in the latter case more or less corrugate.

Hab. On a decorticated fir tree in an upland mountainous district. —*B. M.* Mar Forest, Braemar, Aberdeenshire.

87. **PTYCHOGRAPHA** Nyl. in Flora lvii. p. 315 (1874). (Pl. 24.)

Thallus effuse. Algal cells *Palmella*. Apothecia elongate, compound, with 2 to 4 parallel hymenia; margins prominent, incurved; hypothecium black, carbonaceous; spores 8 in the ascus, simple, colourless.

Distinguished from all other genera of the *Graphidaceæ* by the compound hymenia.

1. **P. xylographoides** Nyl. *l. c.*—Thallus effuse, in thin greyish-white spots or nearly obsolete (K−, CaCl−). Apothecia slightly prominent, plane above, margined, black, concolorous within; epithecium longitudinally 1- or 3-plicate, subincolorous; hypothecium and perithecium black; spores ellipsoid, 0,011–14 mm. long, 0,006–7 mm. thick; hymenial gelatine wine-red with iodine.—Cromb. in Journ. Bot. xii. p. 257, t. 150 (1874); Leight. Lich. Fl. ed. 3, p. 392.

Exsicc. Cromb. n. 192.

Might at first sight be taken for *Xylographa parallela*, which it closely resembles in the parallel grouping of the apothecia. It is, however, at once separated by the peculiar character of the hymenia.

Hab. On a decorticated trunk of *Pyrus Aucuparia* in a subalpine mountainous district.—*B. M.* Craig Calliach, Killin, Perthshire (the only locality).

88. **ENCEPHALOGRAPHA** Massal. Geneac. Lich. p. 13 (1854). *Melanospora* Mudd Man. p. 226 (1861). (Pl. 25.)

Thallus effuse, crustaceous. Algal cells *Palmella*. Apothecia sessile, usually in groups, elongate, roundish or angular, simple or branched; disc usually narrow; hypothecium carbonaceous, black; spores 5 to 8 in the ascus; colourless to dark-brown, 1-septate.

E. cerebrina Massal. Misc. Lich. p. 49 (1856).—Thallus subdeterminate, thickish, tartareous, chalky-white. Apothecia black, scattered or congregate, sessile, oblong, roundish or angular, the

margin inflexed; asci clavate, 8-spored; spores linear-oblong, often slightly constricted in the middle, dark-brown or nearly blackish, 0,015–23 mm. long, 0,008–12 mm. thick; hymenial gelatine bluish with iodine.—*Opegrapha cerebrina* DC. Fl. Fr. ii. p. 312 (1805); Borr. Engl. Bot. Suppl. t. 2632. f. 1; Hook. in Sm. Engl. Fl. v. p. 146; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 88, t. 5, f. 2 (1854); Cromb. Lich. Brit. p. 100. *Melanospora cerebrina* Mudd Man. p. 226, t. 4, f. 88 (1861). *Lithographa cerebrina* Leight. Lich. Fl. p. 361 (1871); ed. 3, p. 394.

Hab. On calcareous rocks in hilly districts.—*Distr.* With certainty only in N. England and S.W. Ireland.—*B. M.* Penhill, Yorkshire; Teesdale, Durham; Whitbarrow, Cumberland; Dunkerron, Kerry.

89. **MELASPILEA** Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 416 (1856). *Stictographa* Mudd Man. p. 226 (1861), pro parte. (Pl. 26.)

Thallus thin, sometimes developed below the bark (hypophlœodal) or wanting. Algal cells *Trentepohlia*. Apothecia black and carbonaceous, superficial or immersed, roundish or elongate, simple or shortly branched, with a proper margin only; disc narrow or flattened; hypothecium colourless or dark-coloured; paraphyses slender, free; asci elongate or narrowly clavate, 8-spored; spores ellipsoid, fusiform, or ovate, colourless, becoming brown, usually 1-septate. Spermogones with simple sterigmata and straight spermatia.

1. **M. lentiginosa** A. Zahlbr. in Engler & Prantl Nat. Pflanzenf. i. 1*, p. 96 (1903).—Thallus thin, smooth, cream-coloured, limited by a brownish-black line. Apothecia very small, black, sessile, oblong or linear, slender, straight, simple; margins tumid, incurved; disc very narrow; asci clavate; spores irregularly obovate, unequally 2-celled, pale brown, 0,015–16 mm. long, 0,006–7 mm. thick.—*Opegrapha lentiginosa* Lyell ex Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 211, t. 6, f. 16 (1854). Carroll in Journ. Bot. iii. p. 291 (1865); Cromb. Lich. Brit. p. 100; Leight. Lich. Fl. p. 372; ed. 3, p. 395. *Stictographa lentiginosa* Mudd Man. p. 226, t. 4, f. 89 (1861).

The thallus forms somewhat extended patches on the bark; the apothecia are usually numerous and crowded and grow in all directions.

Hab. On trees.—*Distr.* Somewhat local, but plentiful where it occurs in S. England and S. Ireland.—*B. M.* Launceston, Cornwall; Lustleigh, Devon; near Brockenhurst and Lyndhurst, New Forest, Hants; St. Leonard's Forest, Sussex; Curraghmore, Waterford; Glenbower Wood and Castle Martyr, near Cork.

2. **M. lentiginosula** A. L. Sm.—Thallus evanescent. Apothecia small, black, prominent, elliptical, straight, rarely forked,

sparsely scattered; disc narrow, slit-like; margins tumid, incurved; spores obovate, brown, 1-septate, constricted, 0,020–23 mm. long, 0,010–11 mm. thick; hymenial gelatine faintly blue with iodine.—*Opegrapha lentiginosula* Nyl. in Flora xlviii. p. 355 (1865); Carroll in Journ. Bot. iv. p. 24 (1866); Cromb. Lich. Brit. p. 100; Leight. Lich. Fl. p. 373; ed. 3, p. 395.

Hab. On pines in subalpine regions.—*B. M.* Glen Falloch and Black Wood of Rannoch, Perthshire.

3. **M. diplasiospora** A. Zahlbr. *l. c.*—Thallus cream-coloured, thin, smooth, effuse. Apothecia small, black, oblong, somewhat immersed, disc rather expanded, the margins thin, elevated, inflexed; spores obovate, dark-brown, 1-septate, constricted, 0,027–32 mm. long, 0,012–16 mm. broad; hymenial gelatine pale blue with iodine.—*Opegrapha diplasiospora* Nyl. in Act. Soc. Sci. Fenn. vii. p. 476 (1863); Carroll in Journ. Bot. vi. p. 100 (1868); Cromb. Lich. Brit. p. 100; Leight. Lich. Fl. p. 373; ed. 3, p. 395.

Similar in appearance to *M. lentiginosa*, but the apothecia are rather larger and the spores larger and darker coloured.

Hab. On holly in upland districts.—*Distr.* Rare in S.W. Ireland.—*B. M.* Torc Mt. and Cromaglown, Killarney, Kerry.

4. **M. ochrothalamia** Nyl. in Flora xlviii. p. 355 (1865).—Thallus effuse thin, sordid-greenish. Apothecia black or brownish, minute, adnate, roundish, plane, obsoletely margined, ochraceous-yellow within; spores ovoid, 1-septate, brownish-black, 0,017–21 mm. long, 0,007–0,010 mm. thick; hymenial gelatine not tinged with iodine.—Carroll in Journ. Bot. vi. p. 101 (1868); Cromb. Lich. Brit. p. 106; Leight. in Lich. Fl. p. 405; ed. 3, p. 436.

Allied apparently to *M. arthonioides* Nyl. (in Act. Soc. Linn. Bord. sér. 3, i. p. 416 (1856)), a plant of France, Switzerland and Algiers, which may also occur in England, but differs in the colours of the apothecia internally, and of the larger spores. The specimens seen are well fertile.

Hab. On smooth bark of trees in upland wooded districts.—*Distr.* Rare in S. and W. Ireland.—*B. M.* Glenbower Wood and near Enniskean, Cork; Mangerton, Killarney, Kerry.

5. **M. amota** Nyl. in Flora l. p. 178 (1867).—Thallus effuse, whitish or scarcely visible Apothecia black, innate, moderate in size, roundish or angular; margins thin, uneven; hypothecium thin, dark-brown; paraphyses slender, very few; epithecium brownish or yellowish-brown; spores 4 to 8 in the ascus, ellipsoid-ovoid, 1-septate, constricted in the middle, colourless or faintly brownish, 0,016–22 mm. long, 0,007–0,010 mm. thick; hymenial gelatine and asci slightly and evanescently blue with iodine.—Carroll in Journ. Bot. v. p. 259 (1867); Leight. in Ann.

Mag. Nat. Hist. ser. 3, xx. p. 256 (1867) & Lich. Fl. p. 404; ed. 3, p. 436; Cromb. Lich. Brit. p. 105.

Distinguished by the rather large apothecia, the almost colourless spores and the almost entire absence of paraphyses. The apothecia are scattered or sometimes several congregate and are often circumcissed.

Hab. On the branches of old trees chiefly oak.—*Distr.* Very local in S.W. Ireland.—*B. M.* Torc Mt., Dinish, Muckruss, Cromaglown and near Derrycurrihy, Killarney, Kerry.

6. **M. constrictella** A. L. Sm.—Thallus whitish, thin. Apothecia black, simple, sometimes aggregate, internally pallid-brown; perithecium lateral; disc broad, concave or flattened; paraphyses crowded, irregular, not well distinct, brown at the apices; hypothecium colourless; spores obovate, colourless, 1-septate, constricted, 0,012–17 mm. long, 0,0045–65 mm. thick; hymenial gelatine untinged with iodine.—*Opegrapha constrictella* Stirton in Scott. Nat. iv. p. 29 (1877); Leight. Lich. Fl. ed. 3, p. 396. Specimen not seen.

Hab. On old bark at Ben Brecht, Argyll.

7. **M. proximella** Nyl. ex Norrl. in Not. Sällsk. Faun. & Fl. Fenn. förh. xiii. p. 342 (1873).—Thallus effuse, whitish, developed under the bark or evanescent. Apothecia small, black, roundish, obtusely margined; disc plane, somewhat wrinkled; hypothecium colourless or sordid; spores ovoid, becoming brown, 1-septate, 0,017–19 mm. long, 0,007–8 mm. thick; hymenial gelatine brownish and then wine-red with iodine.—*Lecidea proximella* Nyl. in Herb. Mus. Fenn. p. 90 (1859) nomen. *Arthonia proximella* Nyl. Lich. Scand. p. 262 (1861); Leight. in Grevillea i. p. 60, t. 4, f. 3 & Lich. Fl. ed. 3, p. 417.

Somewhat resembling *Arthonia patellulata* but differing in the character of the spores.

Hab. On trunks of trees, chiefly oak and holly in wooded upland districts.—*Distr.* Only a few localities in S. and W. England, but no doubt to be detected elsewhere.—*B. M.* Near Stoney Cross, New Forest, Hants; Ardingly Woods, Sussex; near Canterbury, Kent; Braydon Forest, Wilts; Sapperton, Gloucestershire; Dolgelly, Merioneth; near Acton Scott, Shropshire; Gwydir Woods, Bettws-y-Coed and Mael-y-Gest, Carnarvonshire.

8. **M. interjecta** A. L. Sm.—Thallus whitish or faintly greenish, tartareous, thin, furfuraceous, almost evanescent. Apothecia black, elongate, somewhat shining, simple or sometimes branched, solitary or clustered; disc narrow, slit-like, the margins tumid, inflexed; hypothecium black; spores colourless, oblong, 1-septate, 0,021–23 mm. long, 0,009 mm. thick.—*Lithographa interjecta* Leight. Lich. Fl. p. 361 (1871); ed. 3, p. 394. Specimen not seen.

Separated from *Lithographa* by the septate spores, but the species requires reinvestigation.

Hab. On slaty maritime rocks.—*Distr.* Very rare, found only in Wales (Barmouth, Merioneth).

9. **M. vermifera** Leight. in Trans. Linn. Soc. ser. 2, i. p. 146, t. 22. figs. 21–24 (1876).—Thallus obsolete. Apothecia black, minute, irregularly angular, oblong, imbedded in the cortical layer, when dry plane and surrounded by a minute upraised jagged margin of the cortical layer, when wet somewhat convex and immarginate; hymenium pale; paraphyses slender, pale at the apices; asci linear-obovate; spores innumerable, arranged spirally in the ascus, colourless, cylindrical-fusiform, pointed, vermiform, 1-septate.—Leight. Lich. Fl. ed. 3, p. 437. Specimen not seen.

Hab. Parasitic on thallus and apothecia of *Pertusaria globulifera*; Trefriw, Carnarvonshire.

10. **M. Patersoni** Stirton in Scott. Nat. iv. p. 29 (1877).—Thallus whitish or pale, thin or evanescent. Apothecia small, black, plane or somewhat convex; hypothecium brownish or pale; paraphyses slender, somewhat branched, apices interwoven, dark; spores 4 or 5 in the ascus, colourless, acicular-cylindrical, pluriseptate or 10-septate, breaking up at the septa, 0,040–60 mm. long, 0,0025–30 mm. thick.—Specimen not seen.

An aberrant species requiring further investigation.

Hab. On dead bark; Ben Brecht, Argyll.

90. **OPEGRAPHA** Humb. Fl. Friberg. p. 57 (1793). (Pl. 27.)—Thallus crustaceous, superficial or developed under the bark (hypophlœodal), thin or sometimes almost wanting. Algal cells *Trentepohlia*. Apothecia (*lirellæ*) black and carbonaceous, superficial, elongate or roundish, simple or branched, with a proper margin only; disc narrow and slit-like or somewhat flattened and plane; asci clavate or elongate, usually 8-spored; spores colourless, sometimes becoming brownish, linear-oblong, fusiform or acicular, pluriseptate.

Spores 3-septate.

1. **O. herpetica** Ach. Meth. p. 23 (1803).—Thallus thin, more or less cracked or rugged, grey or usually olivaceous, effuse or limited by a brown line. Apothecia small, innate, oval, oblong or linear, obtuse, simple or forked, straight or curved; margins thick, rounded and inflexed, the disc slit-like, dilated in age; spores fusiform, 3-septate, colourless or pale-yellow, 0,017–27 mm. long, 0,004–5 mm. thick; spermogones with arcuate spermatia

0,006–8 mm. long, 0,002 mm. thick (fide Nyl. Lich. Par. p. 107 (1896)).—Engl. Bot. t. 1789?; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 205, t. 5, f. 12a (1854) & Lich. Fl. p. 373; ed. 3, p. 396 (incl. vars. *vera* and *rubella*); Mudd Man. p. 234 (incl. vars. *vera* and *rufescens* with var. *rubida* pro parte); Carroll in Journ. Bot. iii. p. 291 (1865); Cromb. Lich. Brit. p. 99 (incl. var. *disparata* Ach. Syn. p. 73 (1814)). *O. rufescens* Pers. in Ust. Ann. Bot. vii. p. 29, t. 2, f. 3a (1794)?; Hook. in Sm. Engl. Fl. v. p. 144?; Tayl. in Mackay Fl. Hib. ii. p. 105? *O. rubida* Chev. Hist. Graph. p. 80, t. 18, ff. 1 & 2 (1824). *Lichen herpeticus* Ach. Lich. Suec. Prodr. p. 20 (1798). *Hysterina herpetica* S. F. Gray Nat. Arr. i. p. 506 (1821). *H. disparata* S. F. Gray *l. c.*

Exsicc. Leight. n. 221; Mudd n. 214.

Hab. On trees.—*Distr.* Rather frequent throughout the British Islands.—*B. M.* Near Ilsham, Torquay, and near Exeter, Devon; near Lyndhurst, Hants; Hockley Woods, Essex; Charlton Forest, Berks; Oxford; Derbyshire; Airyholme Wood, Easby Wood, Ayton and Ingleby, Cleveland, Yorkshire; near Cartland Crags, Lanarkshire; Dunkeld, Perthshire.

Var. **elegans** Borr. ex Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 207 (1854).—Thallus slightly pulverulent or scurfy. Apothecia small, curved and wavy, often stellate.—Mudd Man. p. 235; f. *elegans* Leight. Lich. Fl. p. 374; ed. 3, p. 397. Var. *rubida* Mudd *l. c.* pro parte.

Exsicc. Leight. n. 286.

Hab. On trees.—*Distr.* Somewhat rare in England and Ireland.—*B. M.* Ivybridge and Ilsham, Torquay, Devon; near Minstead, New Forest, Hants; St. Leonard's Forest, Sussex; near Bath, Somerset; Hollybush Hill, Malvern, Worcestershire; Airyholme Wood and Ingleby, Cleveland, Yorkshire.

Var. **fuscata** Schær. Enum. p. 156 (1850).—Thallus dark, dingy-olive, otherwise as in the species.—*O. herpetica* var. *rufescens* Mudd Man. p. 235 (1861) (excl. syn.), (& var. *rubida* Mudd *l. c.* pro parte); Cromb. Lich. Brit. p. 99; form *rufescens* Leight. Lich. Fl. p. 375; ed. 3, p. 397 pro parte. *O. rubella* Pers. *l. c.* p. 31?; Sm. Engl. Fl. t. 2347 (1811); Hook. in Sm. Engl. Fl. v. p. 144. *Lichen rubellus* Ach. Lich. Suec. Prodr. p. 22 (1798).

Distinguished by the dark thallus. The species *O. rufescens* has been restricted by Nylander (Lich. Par. p. 107 (1896)) to forms similar to *O. herpetica*, but with straight spermatia, 0,004–5 mm. long, 0,001 mm. thick, a character I have been unable to verify in any of our British specimens.

Hab. On trees.—*Distr.* Not uncommon in England and Wales.—*B. M.* Cirencester, Gloucestershire; Chalkney Woods, White Colne, Hadleigh Woods, Ulting, Hatfield Peverel and Epping Forest, Essex; Patcham, near Worcester; Gopsall Wood, Leicestershire; Suffolk; Ingleby, Yorkshire.

Form **arthonoidea** Leight. Lich. Fl. ed. 3, p. 397 (1879).—Thallus as in the preceding variety. Apothecia suborbicular, innate, immarginate, plane.—*Opegrapha rufescens* var. *arthonoidea* Schær. Spicil. p. 328 (1836).

Hab. On ash trees.—*Distr.* Rare in England.—*B. M.* Chalford, Gloucestershire.

Var. **subocellata** Ach. Syn. p. 73 (1814).—Thallus somewhat pulverulent. Apothecia small, oblong, simple or substellate, embedded in the thallus and surrounded by a white margin.—Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 206 (1854) & Lich. Fl. p. 374; ed. 3, p. 396; Mudd Man. p. 234; Cromb. Lich. Brit. p. 99.

Exsicc. Leight. n. 222.

Regarded by Nylander as a variety of *O. rufescens*. It is easily recognized by the spurious white margin of the apothecia. The spermatia in our British specimens so far as observed are minute and somewhat ovoid, 0,003 mm. long and 0,001–2 mm. thick.

Hab. On trees.—*Distr.* Frequent in N. and S. England, rare in Wales, the Channel Islands, and Ireland.—*B. M.* Near Exeter and near Becky Falls, Devon; New Forest, Hants; near Bath, Somerset; Tilgate, near Clayton; near Glynde and Balcombe, Sussex; Epping Forest, Essex; Airyholme Wood, Easby Wood, and Cliffrigg, Cleveland, Yorkshire; Killarney, Kerry.

2. **O. contexta** Stirton in Grevillea iii. p. 35 (1874).—Thallus reddish-buff-coloured, thin, limited by the brown hypothallus. Apothecia small, black, flattened, roundish, usually aggregate, the disc gyrose-plicate; hypothecium blackish-brown; paraphyses indistinct; spores fusiform, blunt at the apices, 3-septate, colourless, 0,017–25 mm. long, 0,0045 mm. thick.—Leight. Lich. Fl. ed. 3, p. 403. Specimen not seen.

Perhaps only a form of the preceding.

Hab. On elm, near Grantown, Invernessshire.

3. **O. atra** Pers. in Ust. Ann. Bot. vii. p. 30 (1794).—Thallus thin, forming whitish or yellowish patches, sometimes limited. Apothecia black, numerous, lying in all directions or subparallel, linear, usually simple, flexuose; disc slit-like, narrow, uniform, the margins thick, elevated, wavy; hypothecium dark, reddish upward; spores obovate-fusiform, 3- or rarely 4-septate, colourless, rather small, 0,014–20 mm. long, 0,004 mm. thick.—Hook. in Sm. Engl. Fl. v. p. 145 pro parte; Tayl. in Mackay Fl. Hib. ii. p. 105; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 203, t. 5, f. 11 (1854) & Lich. Fl. p. 375; ed. 3, p. 398 (incl. f. *tenuior* Nyl. ex Leight. *l. c.* ed. 3, p. 400 (1879)); Mudd Man. p. 232; Cromb. Lich. Brit. p. 98 pro parte. *O. denigrata* Sm. Engl. Bot. t. 1753 (1807) (non Ach.).

Exsicc. Mudd nos 208, 206; Leight. n. 220 (the two latter

as *O. varia* var. *diaphora*); Larb. Lich. Hb. n. 190 (as *O. atra* var. *tenuior*).

Distinguished from *O. herpetica* by the longer, distinctly marginate apothecia and the usually reddish-brown colour internally.

Hab. On trees.—*Dist.* Common throughout the British Isles.—*B. M.* Luxulion, Cornwall; I. of Wight; Beeding Windmill, Three Bridges, Crawley, Mendon, and Saddlescomb, Sussex; Romsey, Hants; Epping Forest, Hatfield Peverel, and Ulting, Essex; Worcester; Bath, Somerset; Bala, Merioneth; Trefriw, Carnarvonshire; Airyholme Wood and near Ayton, Cleveland, Yorkshire; near Glasgow, Lanarkshire; Callander, Perthshire; Killarney, Kerry; Rostellan, Cork; Clonmel, Tipperary; Adare, Limerick; Killery Bay, Connemara.

Form **ochrocheila** Leight. Lich. Fl. p. 377 (1871).—Apothecia with ochraceous margins, the disc somewhat flattened.—Leight. *op. cit.* ed. 3, p. 400. *Opegrapha ochrocheila* Nyl. in Flora xlviii. p. 212 (1865).

Hab. On trees, grass and rocks.—*Dist.* Rare in the Channel Islands, England, and S. Ireland.—*B. M.* St. Peter's Valley, Jersey; Dinish, Killarney, Kerry.

Form **parallela** Leight. Lich. Fl. p. 376 (1871).—Thallus thin, greyish-white. Apothecia linear-elongate, arranged in parallel lines, straight or flexuose.—Leight. Lich. Fl. ed. 3, p. 399. Var. *parallela* Mudd Man. p. 232 (1861).

Exsicc. Leight. n. 245; Mudd n. 209.

A growth form rather than a variety.

Hab. On trees.—*Distr.* Rather common in England, rarer in Scotland and Ireland.—*B. M.* Withiel, Cornwall; Torquay and Lustleigh, Devon; Tilgate and near Glynde, Sussex; near Lyndhurst, New Forest, Hants; Cirencester, Gloucestershire; Alfrick, near Worcester; Ulting, Essex; near Yarmouth, Norfolk; Ludlow, Shropshire; Cockshaw Bank, Cleveland, Yorkshire; Killarney, Kerry; Killery Bay, Connemara, Galway.

Var. **denigrata** Schær. Enum. p. 153 (1850) (excl. syn.).—Thallus smooth, whitish, often determinate. Apothecia crowded together and forming black patches on the thallus.—Mudd Man. p. 232; Cromb. Lich. Brit. p. 98; f. *denigrata* Leight. Lich. Fl. p. 376; ed. 3, p. 398 (incl. f. *nigrata* and f. *hapalea* Leight. *ll. c.*; *Lichen denigratus* Ach. Lich. Suec. Prodr. p. 24 (1798). *Opegrapha stenocarpa* var. *hapalea* Ach. Lich. Univ. p. 257 (1810)). *Hysterina denigrata* S. F. Gray Nat. Arr. i. p. 507 (1821).

Exsicc. Leight. n. 193; Mudd n. 210.

Hab. On trees.—*Distr.* Common throughout the British Isles.—*B. M.* New Forest and Netley Abbey, Hants; Chalford, Gloucestershire; near Glynde and near Crawley, Sussex; Hindlip and near Malvern, Worcestershire; Epping Forest, Ulting and Hadleigh Woods, Essex; Wigmore, Herefordshire; Long Priory, Shropshire; Barmouth, Merioneth; Llanrochwyn and near Llandudno, Carnarvonshire; near Ayton, Cleveland, Yorkshire; near Glasgow, Lanarkshire; Killarney, Kerry.

Var. **arthonoidea** Leight. ex Mudd Man. p. 232 (1861).—Apothecia variously difformed and flattened, crowded and confluent, forming irregular black masses, scattered or subparallel.—F. *arthonoidea* Leight. Lich. Fl. p. 377 (1871); ed. 3, p. 399. *Opegrapha nimbosa* Sm. Engl. Bot. t. 2346 (1811)? (non Ach.).

Exsicc. Leight. n. 338.

Hab. On trees.—*Distr.* Somewhat rare throughout the British Isles.—*B. M.* Withiel, Cornwall; Newton Bushell and Ullacombe, near Bovey Tracey, Devon; Shanklin, I. of Wight; Saddlescomb and St. Leonards, Sussex; New Forest, Hants; Stokesay, Shropshire; Edderton, Montgomeryshire; Epping Forest, Essex; Cottishall, Norfolk; Conway, Carnarvonshire; Airyholme and Cliffrigg, Cleveland, Yorkshire; Swanston, near Edinburgh; Carrigaloe, Cork.

4. **O. atricolor** Stirton in Trans. Glasg. Soc. Nat. 1875, p. 89.—Thallus whitish, thin. Apothecia black, innate, sessile, narrow, somewhat acute, usually simple, internally blackish-grey or pallid brown; disc slit-like, becoming somewhat concave or even flattened, rugulose; hypothecium brownish-black; paraphyses indistinct, irregular, dark-brown at the apices; spores 4–8 in the ascus, oblong-ovoid, 3-septate, colourless, 0,015–21 mm. long, 0,004–5 mm. thick; upper part of hymenium blue, the lower part yellow, becoming wine-red with iodine.—Leight. Lich. Fl. ed. 3, p. 400. Specimen not seen.

Hab. On decorticated wood, near Altnaharra, Sutherland.

5. **O. betulina** Sm. Engl. Bot. t. 2281 (1811) non Pers.—Thallus dull-yellowish, brownish or whitish, often limited by a dark line. Apothecia very prominent, sessile, mostly simple, elongate, the disc narrow, uniform; margins plump, rounded and incurved; hypothecium almost black, the hymenium usually clear and colourless; spores linear-obovate, colourless, 3-septate, occasionally 4-septate, 0,017–23 mm. long, 0,005–7 mm. thick; spermogones with rod-shaped spermatia, 0,004–6 mm. long.—Hook. in Sm. Engl. Fl. v. p. 145 (excl. syn.). *O. herbarum* Mont. in Arch. Bot. p. 302, t. 15, f. 1 (1833)? *O. atra* f. *herbarum* Leight. Lich. Fl. p. 377; ed. 3, p. 399. *O. Turneri* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 202, t. 5, f. 10 (1854) & Lich. Fl. p. 378; ed. 3, p. 400; Mudd Man. p. 231; Cromb. in Grevillea i. p. 173. *O. atrorimalis* Nyl. in Flora xlvii. p. 488 (1864); Cromb. Lich. Brit. p. 98. *O. varia* subsp. *rimalis* Cromb. *l. c.* p. 97 (1870)?

Exsicc. Larb. Lich. Hb. nos. 76, 109.

Forming a transition between *O. atra* and *O. varia*. The apothecia are stouter than in *O. atra*, and the spores broader and with a more distinct epispore, somewhat like those of *O. varia* in appearance, though smaller and usually 3-septate.

Hab. On trees, occasionally on palings.—*Distr.* Somewhat frequent in England, rarer in Scotland and Ireland, not recorded from the Channel Islands.—*B. M.* Lustleigh, Devon; near Lyndhurst, New

Forest, Hants; Cirencester, Gloucestershire; near Lewes, near Steyning, Stanmer Park, Glynde, Beeding, Ardingly and Wakehurst, Sussex; Ulting, Hockley and Hadleigh Woods, and Epping Forest, Essex; Cader Idris, Merioneth; Babraham and Madingley Park, Cambridgeshire; Easby, Kildare, Ayton, and Cliffrigg, Cleveland, Yorkshire; Barcaldine, Argyll; Riverstown, Cork; Old Dromore, Killarney, Kerry; Glenarm, Antrim.

6. **O. prosiliens** Stirton in Grevillea iii. p. 36 (1874).—Thallus white or whitish, thin. Apothecia black, prominent, ovate or oblong; disc narrow; margins rounded and prominent; spores fusiform-ellipsoid, colourless, 3-septate, with a colourless epispore, 0,020–28 mm. long, 0,006–7 mm. thick; spermogones with rod-like spermatia 0,004–6 mm. long.—Leight. Lich. Fl. ed. 3, p. 403. Specimen not seen.

Evidently very close to *O. betulina*, but with longer spores.

Hab. On dead decorticated trees; near Grantown, Invernessshire.

7. **O. saxicola** Ach. Syn. p. 71 (1814).—Thallus effuse, greyish or greenish, or rusty-brown, thin, scurfy. Apothecia scattered, oblong or ovate, long or short, variously branched or difformed and angular; disc slit-like more or less expanded; margins tumid, rounded, incurved; asci slightly thickened at the apex, broadly clavate; spores elliptical or elongate-clavate, colourless, becoming brownish, 3-septate, 0,016–18 mm. long or somewhat longer, 0,006 mm. thick; spermogones with rod-like spermatia 0,004 mm. long; hymenial gelatine wine-red with iodine.—Cromb. Lich. Brit. p. 98; Leight. Lich. Fl. p. 378 pro parte; ed. 3, p. 401 pro parte. *O. rupestris* Pers. in Ust. Ann. Bot. xi. p. 20 (1794)?; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 91 (1854); Mudd Man. p. 228 pro parte.

Exsicc. Leight. n. 243.

Hab. On rocks.—*Distr.* Somewhat rare in the Channel Islands, N. England, Wales, and S.W. Ireland.—*B. M.* Rozel and Boulay Bay, Jersey; Newton, Cleveland, Yorkshire; Nantgwynant, Snowdon, Trefriw and Llandudno, Carnarvonshire; Croghan, Killarney, Kerry.

Var. **Decandollei** Stiz. in Nov. Act. Acad. Leop. Carol. xxxii. 4, p. 26, t. 2, fig. 2 q–z (1865).—Thallus somewhat thicker than in the species, seldom absent, yellowish-green or greyish. Apothecia prominent, massed in small groups, and growing singly, linear-oblong or ovate, usually simple, obtuse at the extremities; spores elongate, rounded at the ends, 0,021–24 mm. long, 0,005 mm. thick.—Cromb. Lich. Brit. p. 98; Leight. Lich. Fl. p. 379; ed. 3, p. 401. *O. saxatilis* DC. Fl. Fr. ii. p. 312 (1805) (non Leight.). *O. saxigena* Tayl. in Mackay Fl. Hib. ii. p. 259 (1836); Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 93 (1854). *O. rupestris* var. *saxigena* Mudd Man. p. 229 (1861).

Exsicc. Leight. n. 311.

Hab. On rocks, chiefly calcareous.—*Distr.* Not common in the Channel Islands, N. England, Wales, Scotland and S. and W. Ireland.

—*B. M.* Island of Sark; near Ayton, Cleveland, Yorkshire; Cader Idris, Barmouth and Llyn Gwernon, Merioneth; Snowdon and Capel Curig, Carnarvonshire; West Water, Fifeshire; Appin, Argyll; Mangerton and Dunkerron, Killarney; Kilkee, Clare; Lettermore, Connemara, Galway.

Form **clarescens** A. L. Sm. Differs from the variety in the more continuous greenish-white thallus and in the more regularly scattered short apothecia.—*O. saxigena* f. *clarescens* Nyl. in Flora lxii. p. 224 (1879); Cromb. in Grevillea viii. n. 30 (1879).

Exsicc. Larb. Lich. Hb. n. 79.

Hab. On rocks.—*Distr.* Rare in W. Scotland and W. Ireland.—*B. M.* Isle of Lismore, Argyll; Twelve Pins and Kylemore, Connemara, Galway.

Var. **Persoonii** Stiz. tom. cit. p. 30, t. 2, f. 2, ρ and σ.—Thallus thin, whitish or greyish. Apothecia oblong, small, often deformed; spores colourless, 3-septate, 0,021–23 mm. long, 0,005–6 mm. thick.—Crom. Lich. Brit. p. 98; Leight. Lich. Fl. p. 380; ed. 3, p. 403. *Lichen Persoonii* Ach. Lich. Suec. Prodr. p. 19 (1798).

Hab. On rocks.—*Distr.* Rare in N. Scotland and W. Ireland.—*B. M.* Craig Tulloch, Perthshire; Kilkee, Clare.

Var. **gyrocarpa** Stiz. tom. cit. p. 29, t. 2, f. 2, e–o.—Thallus greyish, limited and intersected by black lines. Apothecia scattered, sessile, roundish, shortly ellipsoid or deformed, rarely linear; spores 0,020–25 mm. long, 0,004–6 mm. thick.—Cromb. *l. c.*; Leight. *ll. c.* *O. gyrocarpa* Flot. in Flora viii. p. 345 (1825). *Verrucaria umbrosa* Tayl. in Mackay Fl. Hib. ii. p. 97 (1836).

Distinguished by the intersecting lines of the thallus and by the usually deformed apothecia. Stizenberger (*l. c.*) states that the spores are 2-celled or up to 7-celled. This condition has not been verified in the British specimens. The spores are, however, difficult to find in this variety.

Hab. On rocks.—*Distr.* Rare in the Channel Islands, S. England, N. Scotland and S. and W. Ireland.—*B. M.* Noirmont, Jersey; Luccombe, I. of Wight; Carig Mt., Kerry; Adragool, Kylemore, Connemara, Galway.

8. **O. atrula** Nyl. in Flora lx. p. 565 (1877).—Thallus very scanty. Apothecia black, short, oblong, simple, prominent, arranged in a somewhat parallel manner; disc narrow; spores colourless, fusiform-oblong, 3-septate, about 0,016 mm. long, 0,0035 mm. thick.—Cromb. in Grevillea vi. p. 114; Leight. Lich. Fl. ed. 3, p. 400.

Exsicc. Larb. Lich. Hb. n. 39.

The only specimens in the British Museum are imperfect and without asci or spores; the apothecia are small and rather thickly scattered over the substratum.

Hab. On mica-schist stones in shady places.—*B. M.* Kylemore, Connemara, Galway (the only locality).

Var. **hysteriiformis** Cromb. in Journ. Bot. xx. p. 276 (1882).—Thallus greyish, thin or obsolete. Apothecia larger and more prominent than in the species, and the margins sometimes furrowed; spores colourless, 3-5-septate, 0,015–16 mm. long, 0,0035–40 mm. thick.—*O. hysteriiformis* Nyl. in Flora lxii. p. 224 (1879); Cromb. in Grevillea viii. p. 30 (1879).

Hab. On rocks by the sea.—*B. M.* Kylemore, Connemara, Galway (the only locality).

9. **O. grumulosa** Duf. in Journ. Phys. lxxxvii. p. 214 (1818).—Thallus white, thick, farinaceous (Kf + yellow, CaCl + red). Apothecia black, at first immersed then sessile, ellipsoid, roundish, elongate or angular; disc bluish-pruinose; margins thin, prominent, persistent; hypothecium thick, black; paraphyses thickish, shortly branched above and somewhat conglutinate; spores colourless, oblong-fusiform, 3-septate, 0,015–17 mm. long, 0,003–4 mm. thick.—Leight. Lich. Fl. p. 380; ed. 3, p. 403 & in Grevillea ii. p. 171, t. 26, f. 2 (1874).

Apt to be confused with *Lecanactis Dilleniana*, but with a much thicker thallus, and more graphideine apothecia.

Hab. On rocks.—*Distr.* Rare in the Channel Islands and S. England.—*B. M.* Near Rozel, Jersey; Walls of Old Nunnery, Alderney; Lynmouth, Devon; I. of Portland, Dorset.

10. **O. nothiza** Nyl. in Flora lxxx. p. 13 (1880).—Thallus greyish, thin and firm, cracked into small areolæ on a blackish almost obsolete hypothallus. Apothecia black, oblong, roundish or angular; disc plane, usually bluish-pruinose; margins thin, prominent, disappearing; hypothecium thick, brownish-black; paraphyses thickish, shortly branched above and somewhat conglutinate; spores oblong, 3-septate, colourless, 0,015–17 mm. long, 0,003–4 mm. thick.—Cromb. in Grevillea viii. p. 113 & in Journ. Bot. xx. p. 276 (1882). *O. varia* f. *notha* (saxicolous). Leight. Lich. Fl. p. 381; ed. 3, p. 404 (fide Larb. *exsicc.* n. 317).

Exsicc. Larb. Lich. Hb. n. 317; Lich. Cæsar. n. 91.

Perhaps only a growth form of the preceding which it strongly resembles, differing chiefly in the thin grey areolate thallus and the less distinctly pruinose apothecia.

Hab. On rocks.—*Distr.* Rare in the Channel Islands.—*B. M.* La Coupe, East Coast, Jersey; Moulin Huet Bay, Sark.

11. **O. calcarea** Turn. in Sm. Engl. Bot. t. 1790 (1807); Ach. Lich. Univ. p. 250 (1810).—Thallus white or yellowish, tartareous, sometimes very thin and pulverulent. Apothecia linear-elongate, black, simple, curved, flexuose and wavy, usually conglomerate in small crowded masses, sometimes scattered, shining; disc slit-like, rather open; paraphyses crowded, slender, subdiscrete; asci broadly clavate with a thick wall at the tip;

spores somewhat clavate, colourless, sometimes becoming brownish, 3-septate, 0,014–18 mm. long, 0,004–6 mm. thick.—*O. saxatilis* Fr. Lich. Eur. p. 366 (1831), pro parte (non DC.); Hook. in Sm. Engl. Fl. v. p. 145 pro parte; Tayl. in Mackay Fl. Hib. ii. p. 106. *O. Chevallieri* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 90, t. 5, f. 4 (1854) (excl. syn.); Mudd Man. p. 228 (excl. syn.). *O. atra* var. *calcarea* Stiz. in Nov. Act. Acad. Leop.-Carol. xxxii. 4, p. 18, t. 1, f. 5, a–d (1865); Cromb. Lich. Brit. p. 98; var. *Chevallieri* Stiz. *l. c.* p. 20, t. 1, f. 5, t–z; Cromb. *l. c.* *O. saxicola* var. *Chevallieri* Leight. Lich. Fl. p. 379; ed. 3, p. 402. *Hysterina calcarea* S. F. Gray Nat. Arr. i. p. 505 (1821).

Exsicc. Leight. nos. 67, 242; Mudd n. 203; Larb. Lich. Hb. n. 275.

Differs from *O. confluens* in the white and usually more developed thallus, the more crowded and conglutinate paraphyses and the thick apex of the ascus.

Hab. On rocks mostly calcareous or arenaceous, rarely on clay soil.—*Distr.* General throughout the Channel Islands and England, rarer in Scotland and Ireland.—*B. M.* St. Ouen's Bay, Jersey; Bodmin, Cornwall; Kingsbridge and Torquay, Devon; Ventnor, I. of Wight; Ardingly, Hastings and Keymer Church, Sussex; near Cirencester, Gloucestershire; Bathampton, Somerset; Hereford; Leigh Court, Worcestershire; Giltar Point, Tenby, Pembrokeshire; Aberdovey, Merioneth; Holyhead, Anglesey; Great Orme's Head, Carnarvon; Castell-Dinas-Bran, Denbighshire; Parson Drove, Cambridgeshire; Bay of Nigg, Kincardineshire; Kilbarrick Church, near Dublin; Ross and Kilkee, Clare; Glenarm, Antrim.

Form **heteromorpha** A. L. Sm.—Thallus almost obsolete. Apothecia more scattered than in the species and the groups smaller, rather large and prominent, simple or sometimes branched; internal structure similar.—*Opegrapha atra* var. *Chevallieri* f. *heteromorpha* Stiz. tom. cit. p. 21, t. 1, f. 5, α–ξ. *O. atra* f. *heteromorpha* Cromb. Lich. Brit. p. 98 (1870). *O. saxicola* var. *Chevallieri* f. *heteromorpha* Leight. Lich. Fl. ed. 3, p. 402.

Exsicc. Larb. Lich. Hb. n. 77.

Hab. On maritime rocks.—*Distr.* Rare in the Channel Islands, S. England, E. and W. Scotland and S. and W. Ireland.—*B. M.* Port Moulin, Sark; Noirmont, Jersey; Wembury, Devon; Aberdovey, Merioneth; Bay of Nigg, Kincardineshire; near Peterhead, Aberdeenshire; Barcaldine, Argyll; Old Head of Kinsale, and Rostellan, Cork; Twelve Pins and Killery, Connemara, Galway.

12. **O. confluens** Stiz. in Flora xlviii. p. 75 (1865).—Thallus greyish-green, effuse, thin or wanting. Apothecia usually grouped in little masses, rarely solitary and scattered; sessile simple, rather thick, cylindrical, straight or curved and contorted; disc slit-like, becoming somewhat open, the margins rounded, inflexed, becoming acute; paraphyses discrete, slightly swollen and brown at the tips; spores colourless, elongate-ovate, 3-septate,

0,016–24 mm. long, 0,004–6 mm. thick.—Cromb. Lich. Brit. p. 99; Leight. Lich. Fl. p. 378; ed. 3, p. 401.

Exsicc. Cromb. n. 195.

Differs from the preceding in the almost constant absence of thallus, the more lax character of the paraphyses and the thinner walled asci at the tips.

Hab. On rocks.—*Distr.* Rather rare throughout the British Isles. —*B. M.* I. of Wight; near Cirencester, Gloucestershire; Aberdovey, Merioneth; Ayton, Cleveland, Yorkshire; Achosragan, Appin, Argyll; Craig Tulloch, Blair Athole, Perthshire; Dinish Island, Killarney, Kerry; Lettermore, Connemara, Galway.

13. **O. xanthodes** Nyl. in Flora lxi. p. 245 (1878).—Thallus yellow or yellowish-grey, thin rather smooth, cracked into minute areolæ. Apothecia minute, oblong, black with a narrow disc; hypothecium black; paraphyses conglutinate; spores fusiform-oblong, 3- sometimes 4-septate, colourless, 0,015–18 mm. long, 0,005–6 mm. thick; hymenial gelatine wine-red with iodine; spermatia straight, 0,004 mm. long, 0,001 mm. thick.—Cromb. in Grevillea vii. p. 97; Leight. Lich. Fl. ed. 3, p. 404.

Well characterized by the areolate thallus and the minute scattered apothecia.

Hab. On rocks.—*B. M.* Kylemore, Connemara, Galway (the only locality).

14. **O. mirifica** Stirton in Scott. Nat. 1879, p. 17.—Thallus whitish or greyish, thickish, minutely cracked, sometimes nearly granulose, sometimes farinaceous (K−, K.CaCl. + red). Apothecia black, moderate in size, sessile, round or oblong, scattered or aggregate; disc pruinose or naked, at first somewhat concave and then acutely margined, at length plane, often somewhat convex and immarginate; hypothecium black or fuscous-black, thick; paraphyses irregular, indistinct, apices clavate, nigricant; spores 8, colourless, oblong or obtusely fusiform, 3-septate, 0,014–21 mm. long, 0,0035–45 mm. thick; hymenial gelatine wine-red with iodine.—Leight. Lich. Fl. ed. 3, p. 545. Specimen not seen.

Perhaps more nearly allied to *Lecanactis* than to *Opegrapha*.

Hab. On rocks, I. of Cumbrae.

Spores 5–7-septate.

15. **O. paraxanthodes** Nyl. in Flora lxii. p. 357 (1879).—Thallus pale-yellow or pale-greenish, thin, minutely cracked-areolate. Apothecia minute, oblong or linear-oblong, disc slit-like; spores fusiform-oblong, 5- (sometimes 4-) septate, 0,023–25 mm. long, 0,008–9 mm. thick; hymenial gelatine tawny-wine-reddish with iodine; spermatia straight, 0,005–7 mm. long, 0,0006 mm. thick.—Cromb. in Grevillea viii. p. 113 (1880).

Exsicc. Larb. Lich. Hb. without number.

Similar to *O. xanthodes*, but distinguished by the larger spores.

Hab. On shady calcareous rocks.—*B. M.* Achnanure, Galway (the only locality).

16. **O. varia** Pers. in Ust. Ann. Bot. vii. p. 30 (1794).—Thallus effuse, whitish, pulverulent, thin. Apothecia prominent, black, sessile, roundish-oblong, elliptical, or elongate, often attenuate at each end; the margins prominent, rather thin and inflexed or often disappearing; the disc forming a narrow slit or dilated and plane, sometimes almost convex; hypothecium dark-brown; paraphyses slender, wavy and branched, involved above in a brown mucilage; spores irregularly ovate-fusiform, usually 5-septate, colourless or becoming brownish, rather large, 0,020–30 mm. long, 0,007–9 mm. thick.—Hook. in Sm. Engl. Fl. v. p. 145 (excl. syn. *O. lichenoides* and *O. notha*); Tayl. in Mackay Fl. Hib. ii. p. 106 (excl. syn. Engl. Bot. t. 1890 & *O. notha*); Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 94, t. 5, f. 9 (1854) (incl. vars. *pulicaris* Fr. Lich. Eur. p. 364 (1831), *diaphora* Fr. *l. c.* p. 365, *tigrina* Schær. Enum. p. 157 (1850) & *tridens* Schær. *l. c.* p. 158) & Lich. Fl. p. 381; ed. 3, p. 404 (incl. ff. *pulicaris*, *diaphora*, *tigrina* and *tridens*); Mudd Man. p. 229 (incl. vars. *pulicaris*, *signata* (Fr. *l. c.*), *tigrina* f. *tridens* Mudd & *diaphora*); Cromb. Lich. Brit. p. 97 pro parte. *O. diaphora* Ach. Meth. p. 19 (1803); Engl. Bot. t. 2280; *O. signata* var. *tigrina* Ach. Lich. Univ. p. 262 (1810). *Lichen scriptus* var. *pulicaris* Lightf. Fl. Scot. ii. p. 801 (1777). *L. pulicaris* Hoffm. Enum. Lich. p. 14, t. 3, f. 2, f. (1784)? *L. diaphorus* Ach. Lich. Suec. Prodr. p. 20 (1798). *L. signatus* Ach. *l. c.* p. 23. *Alyxoria diaphora* S. F. Gray Nat. Arr. i. p. 504 (1821).

Exsicc. Mudd n. 205; Leight. n. 287 (as *O. varia*, var. *tigrina*).

A very variable species in the form and size of the apothecia, giving rise to numerous varieties which appear to be only forms or stages of growth that are frequently represented side by side on the same specimen. When the apothecia are rather small with the ends rounded or tapering and the margins persistent and incurved, it is f. *pulicaris*; the apothecia are more elongate and obtuse in f. *tigrina*, while in f. *diaphora* the margins tend to disappear, the disc becoming rather wide and flat or slightly convex. Usually the apothecia are simple, straight or bent and numerous, lying in all directions, sometimes they are stellately arranged (f. *tridens*).

Lichen pulicaris Hoffm., though professedly based on Lightfoot's variety, is doubtful and incomplete both in description and figure. Some recent lichenologists have rejected the name *varia*, substituting as species *O. pulicaris*, *O. diaphora* and *O. notha*. The microscopic characters of the apothecia are alike in all; in *O. diaphora* the spermatia are slightly shorter and thicker, 0,003–4 mm. long, 0,002 mm. thick; in *O. pulicaris* they are 0,004 mm. long and 0,001 mm. thick (*fide* Nyl. Lich. Par. pp. 104–5 (1896)).

Hab. On trees.—*Distr.* Common in England and the Channel Islands, rarer in Scotland and Ireland.—*B. M.* Jersey; Appuldurcombe, I. of Wight; Lustleigh, Devon; New Forest, Hants; near Shermanbury, Gravely, Wiston, Wakehurst Park, and St. Leonards, Sussex; Canterbury, Kent; Reigate, Surrey; near Millhill, Middlesex; Quendon and Ulting, Essex; Hollybush Hill, Malvern, Little

Malvern and Norton, Worcestershire; Birkland, Nottinghamshire; Nesscliff, Shropshire; Builth, Brecknockshire; Stanton Park, Derbyshire; Ingleby and Kildale, Cleveland, Yorkshire; Craig Forth, near Stirling; Blair Athole, Perthshire; Ardrum Demesne, Cork; Ballynagarde, Limerick.

Var. **lutescens** Mudd Man. p. 230 (1861).—Margins of apothecia greenish or yellowish pruinose, otherwise similar to the species.—F. *ochrocheila* Leight. Lich. Fl. ed. 3, p. 406 (1879). *O. vulvella* var. *lutescens* Ach. Syn. p. 77 (1814).

Hab. On trees and branches.—*Distr.* N. England and W. Ireland. —*B. M.* Ayton and Ingleby, Cleveland, Yorkshire; Doughruagh Mts., Connemara, Galway.

Var. **notha** Fr. Lich. Eur. p. 364 (1831).—Apothecia oblong or roundish, difformed, small or large, disc plane or convex, the margins often obliterated, otherwise as in the species.—Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 95 (1854); Mudd Man. p. 230; f. *notha* Cromb. Lich. Brit. p. 97 (1870); Leight. Lich. Fl. p. 381; ed. 3, p. 404. *Lichen nothus* Ach. Lich. Suec. Prodr. p. 19 (1798). *Opegrapha notha* Ach. Meth. p. 17 (1803) pro parte; Sm. Engl. Bot. t. 1890; Grev. Fl. Edin. p. 352. *Alyxoria notha* S. F. Gray Nat. Arr. i. p. 504 (1821).

Exsicc. Leight. n. 66.

Connected with the species by intermediate forms, but generally distinguished by the broader and more rounded apothecia.

Hab. On trees; rarely on old palings.—*Distr.* Coextensive with the species.—*B. M.* Lustleigh, Devon; near Bartley Lodge, New Forest, Hants; Millhill, Middlesex; Epping Forest and Ulting, Essex; Fishguard, Pembrokeshire; Malvern and Tibberton, Worcestershire; Bardon Hill, Leicestershire; Montford Bridge, near Shrewsbury and Llanyblodwell, Shropshire; Llangollen, Denbighshire; near Yarmouth, Norfolk; Bilsdale, Ayton and near Guisbrough, Cleveland, Yorkshire; Muckruss Demesne, Killarney, Kerry; Rostellan, near Cork; Adare and near Limerick; near Ballinakill, Connemara, Galway.

Var. **rimalis** Fr. Lich. Eur. p. 365 (1831).—Apothecia short or elongate, simple, straight or flexuose, narrow; disc narrow; margins elevated, inflexed; spores usually 5- sometimes 4-septate. —Mudd Man. p. 231 pro parte; Leight. Lich. Fl. p. 383: ed. 3. p. 406. *O. rimalis* Ach. Lich. Univ. p. 260 (1810). *O. varia* f. *herbicola* Leight. Lich. Fl. ed. 3, p. 406 (1879). *O. diaphora* var. *herbicola* Nyl. in Flora lx. p. 463 (1877).

Exsicc. Leight. n. 192; Mudd n. 207.

Hab. On trees, shrubs or ferns; rarely on wood.—*Distr.* Common and coextensive with the species.—*B. M.* Withiel, Cornwall; Crawley, Sussex; Epping Forest and Stansted Mountfitchet, Essex; Gopsall, Leicestershire; Kildale and Cleveland, Yorkshire; Malvern, Worcestershire; Craig Tulloch, Blair Athole, Perthshire; Carrigogunnel, Limerick; Doughruagh Mts., Connemara, Galway.

17. **O. vulgata** Ach. Meth. p. 20 (1803).—Thallus effuse, membranaceous, smooth or cracked and scaly, sometimes pulverulent, greyish-white or brownish. Apothecia prominent, scattered or crowded, varying in size, short and roundish or oblong, or elongate, slender, linear, sometimes bent and wavy, occasionally branched; disc narrow, uniform; margins round, inflexed; hypothecium dark-brown, paraphyses slender, branched above; epithecium brown; spores colourless, elongate, narrowly fusiform, 5–7-septate (rarely 9-septate?), 0,015–29 mm. long, 0,002–4 mm. thick, usually about 0,025–27 mm. long, 0,003 mm. thick; spermogones with curved slender spermatia, 0,014–16 mm. long or shorter, 0,001 mm. thick.—Engl. Bot. t. 1811; Hook. Fl. Scot. ii. p. 43 & in Sm. Engl. Fl. v. p. 145; Grev. Fl. Edin. p. 352; Tayl. in Mackay Fl. Hib. ii. p. 106; Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 208, t. 5, f. 13a (excl. ff. *lithyrga* and *steriza*, incl. var. *stenocarpa* Leight. *l. c.* p. 209, f. 13a, 1 (1854)) & Lich. Fl. p. 383; ed. 3, p. 406 (incl. f. *stenocarpa*); Mudd Man. p. 232 (incl. vars. *stenocarpa* Leight. & *dubia* Mudd); Cromb. Lich. Brit. p. 99 (excl. f. *lithyrga*). *O. stenocarpa* Ach. Lich. Univ. p. 257 (1810) pro parte. *O. amphotera* Nyl. in Flora xlix. p. 374 (1866); Leight. in Ann. Mag. Nat. Hist. ser. 3, xix. p. 406 (1867) & Lich. Fl. p. 386; ed. 3, p. 410; Cromb. Lich. Brit. p. 99. *O. devulgata* Nyl. in Flora lxii. p. 358 (1879); Cromb. in Grevillea vii. p. 113. *Lichen vulgatus* Ach. Lich. Suec. Prodr. p. 21 (1798) (excl. syn.). *Hysterina vulgata* Gray Nat. Arr. i. p. 506 (1821).

Exsicc. Bohl. n. 127; Leight. nos. 194, 312 (as *O. dubia* Leight.), 381; Mudd n. 211; Larb. Lich. Hb. 110.

Distinguished from the preceding species by the form of the spores, which show considerable variation in length and septation according to the stage of development. The apothecia vary greatly in size, being sometimes very long and numerous (f. *stenocarpa*), though usually both short and long fruits occur on the same specimen. The thallus, usually brownish-green, is greyish and continuous when it occurs on pines (*O. amphotera* Nyl.).

Hab. On the bark of trees; rarely on wood.—*Distr.* Frequent in the Channel Islands, England and Ireland; somewhat rare in Scotland, though probably overlooked.—*B. M.* Rozel Manor, Jersey; Withiel and near Penzance, Cornwall; Torquay, Devon; New Forest, Hants; Woolsenbury, Saddlescomb, Mount Harry, Hayward's Heath, Wivelsfield, Charlton Forest and near Plumpton, Sussex; Brastead, Kent; Northampton; Twycross, Leicestershire; Suffolk; Sutton, Haughmond Hill and near Shrewsbury, Shropshire; Mundon, Chalkney Woods, Hadleigh Woods, Ulting and Epping Forest, Essex; Worcestershire; Coltishall and Yarmouth, Norfolk; Madingley Park, Cambridgeshire; Easby Wood and Ayton, Cleveland, Yorkshire; Monmouth; Dolgelly, Merioneth; Trefriw, Gwydir Woods, Bettws-y-Coed and Bryn Maelgwyn, Carnarvonshire; Airds, Appin, Argyll; near Callander, Perthshire; Deer Park, Castlemartyr and near Cork; Blackwater Bridge, Dinish, Torc Mt., Deer Park and Derrycunihy, Killarney, and Glencar, Kerry; Castleconnel and Carrigogunnel, Limerick.

Var. **siderella** Nyl. in Mém. Soc. Sci. Nat. Cherb. v. p. 131 (1857) & in Act. Soc. Linn. Bord. sér. 3, i. p. 405 (1856).—Thallus usually smooth. Apothecia narrow, often slightly flattened, growing in more or less radiate-stellate groups; spermogones with shorter slightly-bent or straight spermatia 0,003–6 mm. long, 0,001 mm. thick.—Mudd Man. p. 233. Var. *subsiderella* Nyl. Lich. Scand. p. 255 (1861); Cromb. Lich. Brit. p. 99; f. *subsiderella* Leight. Lich. Fl. p. 385 (1871); ed. 3, p. 407. *O. hapaleoides* Nyl. in Flora lii. p. 296 (1869)? Cromb. in Journ. Bot. xi. p. 135 (1873); Leight. Lich. Fl. ed. 3, p. 408. *Lichen siderellus* Ach. Lich. Suec. Prodr. p. 24 (1798)?

Exsicc. Mudd n. 212; Larb. Lich. Hb. n. 78 (as *O. hapaleoides*).

Hab. On bark of trees.—*Distr.* Somewhat rare throughout Great Britain.—*B. M.* Near Lustleigh, Devon; near Brockenhurst, New Forest, Hants; near Lewes, near Poynings Springs, Beeding and Blatchington, Sussex; Broomfield and Bocking, Essex; Alfrick and Norton, and near Claines, Worcestershire; Dolgelly, Merioneth; Easby, Cleveland, Yorkshire; Nannau, Dolgelly, Merioneth; Barcaldine, Argyll; Kenmore, Perthshire; Carrigaloe, near Cork; Muckruss Demesne, Killarney, Kerry; Doughruagh Mt., Glendalough and Kylemore, Connemara, Galway.

18. **O. areniseda** Nyl. in Flora lviii. p. 446 (1875).—Thallus scarcely visible. Apothecia black, linear, very long, massed in small heaps; disc narrow; hypothecium blackish-brown; paraphyses slender, branched, conglutinate; spores colourless, fusiform, 3–5-septate, up to 0,030 mm. long, 0,004–6 mm. thick; spermogones heaped in small groups with straight spermatia, 0,0035–45 mm. long, 0,001 mm. thick.—Cromb. in Journ. Bot. xiv. p. 362 (1876); Leight. Lich. Fl. ed. 3, p. 406. *O. actophila* Nyl. in Flora lxiii. p. 13 (1880); Cromb. in Grevillea viii. p. 113 & in Journ. Bot. xx. p. 276 (1882).

Nylander gives spore measurements as 0,014–16 mm. long; when fully developed, however, they measure from 0,020–30 mm. in length, and are usually 5-septate.

Hab. On sandy soil and old wood.—*Distr.* Very rare in the Channel Islands (Jersey).—*B. M.* On sandy soil: Noirmont and Belcroute Bay. On decayed rafters: St. John's.

19. **O. zonata** Koerb. Syst. Lich. Germ. p. 279 (1855).—Thallus reddish or reddish-brown, thin, subtartareous, smoothish, with numerous yellowish-white soredia, limited and intersected by raised blackish lines formed by the hypothallus. Apothecia small, brownish-black, scattered, shortly oblong or round, the margins elevated, often resembling the perithecium of a *Verrucaria*; hypothecium subtended by a thinnish black line, colourless or brownish; paraphyses conglutinate; spores elongate-fusiform, 5-septate, 0,016–21 mm. long, 0,003–4 mm. thick.—Leight. Lich.

Fl. ed. 3, p. 408. *Verrucaria horistica* Leight. Lich. Fl. p. 451 (1871); ed. 3, p. 482 & in Grevillea i. p. 60, t. 4, f. 1.

Well characterized by the presence of soredia, and usually by the numerous, prominent, intersecting black lines.

Hab. On rocks.—*Distr.* Rare in the Channel Islands, N. Wales and N. England.—*B. M.* Port Gorey, Sark; Boulay Bay, Jersey; Cader Idris, Merioneth; Llyn Cwlyd, near Capel Curig, Bettws-y-Coed and Trefriw, Carnarvon; above Scroggs Bridge, Westmoreland.

20. **O. cæsariensis** Nyl. in Flora li. p. 477 (1868).—Thallus white, indeterminate, thin, often only slightly developed. Apothecia prominent, cylindrical, simple, subflexuose about 1 mm. in length; disc slit-like; paraphyses conglutinate; hypothecium and epithecium dark-brown or blackish; spores oblong-fusiform, colourless, 5-septate, 0,017–21 mm. long, 0,004 mm. thick.—Cromb. Lich. Brit. p. 99; Leight. Lich. Fl. p. 383; ed. 3, p. 406.

Exsicc. Larb. Lich. Hb. n. 353 & Lich. Cæsar. n. 43 (?) (improperly developed).

Hab. On quartzose rocks.—*Distr.* Rare in the Channel Islands and S. England.—*B. M.* Sark; near Rozel, La Coupe, Noirmont and L'Etacq (?); Jersey; the Lizard and Pentire, St. Minver, Cornwall.

21. **O. lithyrga** Ach. Lich. Univ. p. 247 (1810) pro parte & Syn. p. 72 (1814) (incl. var. *steriza*).—Thallus greenish-grey, dark-coloured, or whitish, sometimes wanting. Apothecia roundish, elongate-ovoid or usually elongate and slender, simple or sometimes divided, rarely stellately arranged or in groups; disc narrow; margins incurved; paraphyses slender, distinct, not discrete; spores narrow, fusiform, colourless, 5–7-septate, 0,020–28 mm. long, 0,003, rarely 0,004–5 mm. thick; spermogones with straight or slightly-bent spermatia, 0,004–5 mm. long, 0,001 mm. thick.—*O. vulgata* vars. *lithyrga* & *steriza* Nyl. Lich. Scand. p. 255 (1861); f. *lithyrga* Stiz. in Nov. Act. Acad. Leop.-Carol. xxxii. 4, p. 7, t. 1, f. 2 (1865); Cromb. Lich. Brit. p. 99; Leight. Lich. Fl. p. 385; ed. 3, p. 408; f. *steriza* Leight. *ll. c.*

Exsicc. Larb. Lich. Hb. nos. 318, 354; Lich. Cæsar. n. 42.

Distinguished by the usually slender thread-like apothecia and by the narrow spores resembling those of *O. vulgata*.

Hab. On rocks.—*Distr.* Rare in the Channel Islands, Central England and S. and W. Ireland.—*B. M.* St. Brelade's Bay and Noirmont, Jersey; Crogham, Killarney, Kerry.

22. **O. lithyrgodes** Nyl. in Flora lviii. p. 106 (1875).—Thallus reddish-brown, thin, continuous. Apothecia minute, scattered, shining-black, sessile, oblong or linear-oblong; disc narrow; margins thickish, round, inflexed; spores elongate,

fusiform, 7-septate, 0,032 mm. long, 0,006 mm. thick; spermogones with arcuate spermatia.—Leight. Lich. Fl. p. 409.

Exsicc. Larb. Lich. Hb. n. 191.

Somewhat similar to the following in the form and septation of the spores, but differing in the thallus and in the constantly minute apothecia.

Hab. On rocks.—*Distr.* Rare in W. Ireland. –*B. M.* Lough Muck, Connemara, Galway.

23. **O. Leightonii** Cromb. ex Leight. Lich. Fl. p. 385 (1871). —Thallus effuse, varying in thickness, pulverulent, greyish-green or chalky-white, sometimes wanting. Apothecia prominent, linear-elliptical, usually rather long and stout, straight or flexuose, simple or occasionally forked; disc becoming somewhat expanded and naked or greyish-pruinose; margins at first thick and elevated, becoming thinner; spores subclavate, fusiform, colourless, sometimes becoming brownish, straight or bent, 5–7-septate, usually 6-septate, the central cell somewhat larger, 0,025–31 mm. long, 0,005–6 mm. thick.—Leight. op. cit. ed. 3, p. 409. *O. saxatilis* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 89, t. 5, f. 3 (1854) (excl. syn.) (non DC.); Mudd Man. p. 227 (excl. syn.).

Exsicc. Mudd n. 202.

Easily distinguished by the form and septation of the spores. When well-developed, it is one of our most beautiful species, the prominent black fruits being in striking contrast with the light coloured thallus. The apothecia are sometimes few and scattered or numerous and lying in all directions, often arranged in a substellate manner.

Hab. On calcareous and sandstone rocks.—*Distr.* Rather uncommon throughout England, rare in Ireland, not yet recorded for Scotland.—*B. M.* Saltash, Cornwall; Ilsham, Torquay, Devon; Fulking, Sussex; Duntisborne and Barnsly Park, Gloucestershire; Netley Abbey, Hants; Donnington Castle, Berks; The Bartons near Ledbury, Herefordshire; Bartlow Church, Essex; Aberdovey, Merioneth; Earl's Barton, Northamptonshire; Newton Wood, Cleveland, Yorkshire; Killarney, Kerry.

Spores 7- to multi-septate.

24. **O. lyncea** Borr. ex Hook. in Sm. Engl. Fl. v. p. 144 (1833). —Thallus white, tartareous, pulverulent, unequal. Apothecia black, immersed, oblong or linear-oblong, short or elongate, simple, curved, the disc open, plane, bluish-grey-pruinose; margins stout, elevated, wavy; paraphyses indistinct; spores elongate-fusiform, colourless, about 7-septate, 0,022–30 mm. long, 0,004 mm. thick; spermogones with oblong spermatia 0,004 mm. long, 0,001 mm. thick.—Mudd Man. p. 229; Cromb. Lich. Brit. p. 100; Leight. Lich. Fl. p. 386; ed. 3, p. 409. *Lichen lynceus* Sm. Engl. Bot. t. 809 (1800). *Arthonia lyncea* S. F. Gray Nat. Arr. i. p. 479 (1821). *Lecanactis lyncea* Eschw. Syst. Lich.

p. 14, f. 7 (1824); Fr. Lich. Eur. p. 375 (1831). Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 391 (1854).

Exsicc. Leight. n. 195; Mudd n. 204; Larb. Lich. Hb. n. 111.

Easily recognized by the whitish thallus which sometimes spreads over large patches of the bark, and by the grey-pruinose apothecia. These are occasionally attacked by a fungus which changes them into a disintegrated blackish mass. This condition (*Spiloma versicolor*, Sm. Engl. Bot. t. 2076, *S. variolosum* t. 2077 (1809)? Turn. & Borr. Lich. Brit. p. 35 (1839) & *S. nigrum* pro parte?) was named by Fries *O. lyncea* var. *spilomatica* (Lich. Eur. p. 376), and later by Nylander *Spilomium graphideorum* (in Act. Soc. Linn. Bord. sér. 3, i. p. 398 (1856)).

Hab. On old oaks.—*Distr.* Rather rare in the Channel Islands and England.—*B. M.* Brockenhurst, New Forest, Hants; near Glynde, Danny, Hurstpierpoint; Parham Park, Sussex; Holmwood, Surrey; Thorndon Hall, Gosfield Hall, and Epping Forest, Hainault Forest, Essex; Penshurst, Kent; Tickworth Park and Dennington Park, Suffolk; Sherwood Forest, Nottinghamshire; Purton, Wiltshire; Donnington Park, Leicestershire; Haughmond Hill, Shropshire; Hoggarts Wood, Ingleby, Cleveland, Yorkshire.

25. **O. prosodea** Ach. Meth. p. 22 (1803).—Thallus effuse, thickish, membranaceous, dull-pallid-brownish. Apothecia prominent, stout, subcylindrical, somewhat shining, straight; disc narrow; margins elevated, connivent; paraphyses distinct; spores elongate-fusiform, colourless, up to 17-septate, about 0,050–60 mm. or more long, 0,006 mm. thick; spermogones rod-shaped 0,005–6 mm. long, 0,007 mm. thick.—Nyl. in Prodr. Fl. N. Gran. p. 568; Cromb. Lich. Brit. p. 99; Leight. Lich. Fl. p. 387; ed. 3, p. 410.

Exsicc. Larb. Cæsar. n. 92.

Hab. On bark of trees.—*Distr.* Rare in Channel Islands and S. England.—*B. M.* Ann Port and St. Peter's Valley, Jersey; Newton Bushell, Devon; New Forest, Hants; Shiere, Surrey.

26. **O. viridis** Pers. ex Ach. Meth. p. 22 (1803).—Thallus pale-yellowish or brownish, thin, somewhat vaguely limited. Apothecia innate or sessile, oblong or linear, rounded, straight or curved mostly simple; disc narrow, uniform, the margins rounded, inflexed; spores elongate-acicular or narrowly fusiform, up to 15-septate, colourless, 0,040–80 mm. long, 0,006–7 mm. thick; spermogones with arcuate spermatia 0,014–16 mm. long, 0,0005 mm. thick.—Cromb. Lich. Brit. p. 100; Leight. Lich. Fl. p. 387; ed. 3, p. 410. *O. siderella* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 209, t. 6. f. 14 (1854) (non Ach.?). *O. rubella* Mudd Man. p. 233, t. 4, f. 90 (1861) (non Pers.?).

Exsicc. Mudd n. 213 (as *O. rubella*).

Distinguished from the preceding by the thinner thallus and the smaller and more slender apothecia.

Hab. On the bark of trees.—*Distr.* Rare in the Channel Islands, England, Wales and Ireland.—*B. M.* Near St. Martin's Church, Jersey; near Penzance, Cornwall; Ullacombe, near Bovey Tracey, Devon; near Stoney Cross, New Forest, Hants; near Glynde, Sussex; Shiere, Surrey; Epping Forest, Essex; Dolgelly, Merioneth; Trefriw, Carnarvon; Hoggart's Wood, Ingleby, Cleveland, Yorkshire; Castle Bernard Park, Cork; Torc Mt. and Dinish, Killarney.

Form **taxicola** Cromb. Lich. Brit. p. 100 (1870).—Differs from the species in the slightly pulverulent thallus and in the more prominent larger elongate apothecia which are usually simple, and scattered or thickly congregate.—Leight. Lich. Fl. p. 388; ed. 3, p. 411. *Opegrapha taxicola* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 210, t. 6, f. 15 (1854). *O. rubella* var. *taxicola* Mudd Man. p. 234 (1861).

Hab. On yew.—*Distr.* Rare in England, Wales and Ireland.—*B. M.* Brockenhurst, New Forest, Hants; Barcombe, near Lewes, Balcombe and Storrington, Sussex; Kingsdown, Kent; Twycross, Leicestershire; Llanrychwyn, Carnarvon; Killarney, Kerry.

27. **O. involuta** Nyl. in Mém. Soc. Sci. Nat. Cherb. v. p. 131 (1858).—Thallus brownish-green, thin, continuous. Apothecia sessile, irregularly elongate or roundish-deformed; disc more or less flattened, the margins thickish and involute; spores 4 to 6 in the ascus, fusiform, colourless, multi-septate.—Carroll in Journ. Bot. iii. p. 291 (1865); Leight. Lich. Fl. ed. 3, p. 411. *Graphis involuta* Wallr. Fl. Crypt. Germ. p. 329 (1831). Specimen not seen.

Closely allied to and perhaps only a growth form of the preceding from which it differs in the roundish *Lecidea*-like apothecia.

Hab. On bark of holly.—*Distr.* Rare in S. England and S. Ireland.

91. **GRAPHIS** Adans. Fam. Pl. ii. p. 11 (1763), pro parte; Ach. Lich. Univ. p. 46 (1810), pro parte; Muell.-Arg. in Mém. Soc. Phys. Hist. Nat. Genève xxix. n. 8, p. 28 (1887). *Aulacographa* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 389 (1854); Mudd Man. p. 242. (Pl. 28.)

Thallus crustaceous, thin, superficial or developed under the bark (hypophlœodal). Algal cells *Trentepohlia*. Apothecia (*lirellæ*) elongate, rarely roundish, immersed then erumpent, simple or branched; disc narrow and slit-like, rarely somewhat plane; proper margins tumid, prominent, furrowed (*Aulacographa*) or even; hypothecium colourless or dark-coloured; asci clavate or elongate, usually 8-spored; spores colourless, elongate, pluriseptate, the cells transversely lentiform.

The genus, as understood by modern lichenologists, includes only species with colourless septate spores. In the British forms the apothecial wall is mostly developed only at the sides (dimidiate); in warmer regions species occur with a well developed carbonaceous base.

1. **G. elegans** Ach. Syn. Lich. p. 85 (1814).—Thallus pale cream-coloured or greyish-white, thin, membranaceous, granular or wrinkled. Apothecia linear-elongate, simple, straight or curved; perithecial wall continuous or with a small opening under the base; proper margins thick, longitudinally furrowed; paraphyses slender, inspersed with small granules; spores cylindrical-fusiform, with a hyaline epispore, 10–12-septate, 0,035–55 mm. long, 0,008–11 mm. thick.—S. F. Gray Nat. Arr. i. p. 503; Cromb. Lich. Brit. p. 96; Leight. Lich. Fl. p. 362; ed. 3, p. 427. *Opegrapha elegans* Borr. in Sm. Engl. Bot. t. 1812 (1807); Hook. in Sm. Engl. Fl. v. p. 146. *O. sulcata* Moug. & Nestl. ex DC. Fl. Franc. vi. p. 171 (1815); Tayl. in Mackay Fl. Hib. ii. p. 107. *Aulacographa elegans* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 389, t. 7, f. 26 (1854); Mudd Man. p. 262, t. 4, f. 93.

Exsicc. Baxter Stirp. Crypt. n. 21; Bohl. n. 27; Leight. n. 68; Mudd n. 223; Larb. Lich. Hb. n. 156; Carroll Lich. Hib. without number.

Characterized by the furrowed margin of the prominent apothecia, though occasionally the furrows are not well developed.

Hab. On trees, finest on holly.—*Distr.* General and common in England and Ireland, somewhat rare in Scotland.—*B. M.* Withiel, Cornwall; Ivy Bridge, near Beckley, Becky Falls, near Exeter, and Tavy Valley, Devon; Lyndhurst, New Forest, Hants; St. Leonard's Forest, Henfield, Eridge Park, Ardingly and Peas Pottage Gate, near Horsham, Sussex; Bagley Woods, Berks; Charnwood Forest, Leicestershire; Knole Park, Kent; Woodham Walter Common, Hockley and Hadleigh Woods, Essex; Malvern, Worcestershire; Dolgelly, Merioneth; Crafnant and Church Stretton, Shropshire; Gloddaeth, near Conway; Capel Curig and Gwydir Woods, Bettws-y-Coed, Carnarvonshire; Chatsworth, Derbyshire; Roche Abbey and Baysdale, Cleveland, Yorkshire; near Glasgow, Lanarkshire; Ben Lomond, Dumbartonshire; Inverary and near Bonawe, Lorne, Argyll; Glen Tilt, Perthshire; Castle Bernard Park, Bandon, Brown's Demesne, near Riverstown, and Ballyedmond, Cork; Torc Mt., Lough Inchiquin, Dinish, and Croghan, Killarney, Kerry; Kylemore, Connemara, Galway.

Form **parallela** Leight. Lich. Fl. ed. 3, p. 427.—Apothecia narrow, straight, rather long, arranged in a parallel manner.—*Opegrapha elegans* var. *parallela* Schær. Enum. p. 152 (1850).

Hab. On the bark of cherry and other trees.—*Distr.* Somewhat uncommon in S. and Central England, N. Scotland and Ireland.—*B. M.* Ullacombe, Bovey Tracey, Devon; New Forest, Hants; Wych Cross and High Rocks, Tunbridge Wells, Sussex; Church Stretton, Shropshire; Cader Idris, Merioneth; Trefriw, Carnarvonshire; Glen Tilt, Perthshire; Glengarriff, Cork; Doughruagh Mt., Kylemore, Connemara, Galway; Tullymore Park, Down.

Form **stellata** Leight. *l. c.*—Apothecia rather short, arranged in radiate stellate groups.

Hab. On trees.—*Distr.* Rare in S. and Central England and

S. Ireland.—*B. M.* Ivy Bridge, Devon; New Forest, Hants; Woodham Walter Common, Essex; Hollybush Hill, Malvern, Worcestershire; Torc Mt., Killarney.

Form **coacervata** Leight. *l. c.*—Apothecia aggregate in small scattered groups.

Hab. On trees, especially holly.—*Distr.* Rare in S. and Central England.—*B. M.* Epping Forest, Essex; Holly Park, near Stokesay, Shropshire.

2. **G. petrina** Nyl. in Flora lix. p. 310 (1876).—Thallus greyish-white or scarcely visible. Apothecia few, black, linear, simple; disc narrow, slit-like, the margins tumid, longitudinally furrowed, often white-pruinose; spores elongate, 7–11-septate, brownish, 0,036–50 mm. long, 0,007–011 mm. thick.—Cromb. in Grevillea v. p. 28 & in Journ. Bot. xiv. p. 362 (1876); Leight. Lich. Fl. ed. 3, p. 427.

Scarcely different except in habitat from the preceding species.

Hab. On wet micaceous rocks.—*Distr.* Rare in W. Ireland.—*B. M.* Near Renvyle, Connemara, Galway.

3. **G. ramificans** Nyl. in Flora lix. p. 575 (1876).—Thallus whitish or creamy-white, thin, somewhat wrinkled (K + yellow then orange). Apothecia black, slightly prominent, branched in a dendroid manner; epithecium narrow; proper margins thin, sometimes furrowed, wavy and crisp; apothecial wall colourless at the base (dimidiate); paraphyses slender, conglutinate, swollen and brown at the tips; spores elongate-linear or cylindrical, colourless (becoming pale-reddish ?), 10–12-septate, 0,035–45 mm. long, 0,008–010 mm. thick.—Cromb. in Grevillea v. p. 107; Leight. Lich. Fl. ed. 3, p. 433.

Exsicc. Larb. Lich. Hb. without a number.

Closely allied to *G. striatula*, a species from the tropics and Portugal. The apothecia often lie closely parallel to each other, and the margins are occasionally furrowed. The spores in the specimens examined are colourless and measure up to 0,067 mm. long, 0,012 mm. thick.

Hab. On bark of holly.—*B. M.* Lough Feagh and Glendalough, Connemara, Galway (the only localities).

4. **G. scripta** Ach. Lich. Univ. p. 265 (1810).—Thallus thin, membranaceous or subtartareous, greyish-white, cream-coloured or olivaceous, even or wrinkled, effuse or limited by a black line. Apothecia elongate, slender, immersed, then erumpent, the thallus forming an outer white margin, or becoming superficial and prominent, straight or curved, simple or branched; margins narrow, elevated, often wavy and crisp; apothecial wall thick and black, colourless at the base (dimidiate); paraphyses slender, slightly swollen and brown at the tips; spores colourless, sometimes becoming brownish, elongate-cylindrical, 7–10-septate,

0,020–45 mm. long, 0,007–010 mm. thick; spermogones with minute spermatia 0,002–3 mm. long, 0,001 mm. thick.—S. F. Gray Nat. Arr. i. p. 502 (excl. syn. Engl. Bot.); Hook. Fl. Scot. ii. p. 43; Leight. Lich. Fl. p. 363; ed. 3, p. 428 (incl. ff. *diffusa*, *varia*, *flexuosa*, and *divaricata*); Mudd Man. p. 237 (incl. vars. *abietina* (non Schær.), *varia*, *flexuosa*, and *divaricata*); Cromb. Lich. Brit. p. 96. *G. serpentina* Leight. in Ann. & Mag. Nat. Hist. ser. 2, xiii. p. 269, t. 6, f. 20 (incl. vars. *diffusa*, *varia*, *flexuosa*, and *divaricata* (non Ach.)). *Lichenoides crusta tenuissima, peregrinis velut litteris inscripta* Dill. Hist. Musc. p. 125, t. 18, f. 1B (1760). *Lichen scriptus* L. Sp. Plant. p. 1140 (1753); Lightf. Fl. Scot. p. 800; With. Arr. ed. 3, iv. p. 4. *Opegrapha scripta* Ach. Meth. p. 30 (1803); Grev. Fl. Edin. p. 353 pro parte; Hook. in Sm. Engl. Fl. v. p. 147 pro parte; Tayl. in Mackay Fl. Hib. ii. p. 106 pro parte.

Exsicc. Leight. nos. 19 (pro parte), 21; Larb. Lich. Cæsar. n. 88.

A very variable species in the form and appearance of the thallus and apothecia. In the typical plant the thallus is developed beneath, or confused with, the outer layers of the cortex and is usually determinate, sometimes limited by a black line, the f. *limitata* of continental lichenologists (*Opegrapha limitata* Pers. in Ust. Ann. vii. p. 30 (1794)). The apothecia are usually very long and narrow, sometimes almost thread-like (var. *tenerrima* Ach. *l. c.* p. 266), naked or subpruinose, straight or curved (f. *flexuosa* Leight. *ll. c.*), simple, sparingly scattered over the thallus (f. *diffusa* Leight. *ll. c.*; var. *abietina* Mudd *l. c.*), or branched, crowded and lying in all directions (f. *varia* Leight. *ll. c.*). In f. *divaricata* Leight. *ll. c.* they are rather short, and distinguished by one or more lateral branches growing out at right angles, but this character is confined to very few of the apothecia present on any specimen. The more definitely marked varieties are recorded below. The spores are normally colourless; the brown colouration, as in some other cases, is largely due to arrested growth or to premature decay.

Hab. On bark of various trees.—*Distr.* Common in England and Ireland, less frequently recorded from Scotland.—*B. M.* Jersey; Withiel, Cornwall; Torquay, Devon; New Forest, Hants; near Handcross, Ardingly, Danny, Midhurst, St. Leonard's Forest, Sussex; Codham Hall and White Colne, Essex; Bath, Somerset; Chepstow, Monmouthshire; Gopsall and Twycross, Leicestershire; Dolgelly and Barmouth, Merioneth; Gloddaeth, near Conway, Trefriw and Gwydir Woods, Bettws-y-Coed, Carnarvonshire; Kildale, Airyholme Wood, Easby Wood and Newton Wood, Cleveland, Hobhole and Ayton, Yorkshire; near Glasgow, Lanarkshire; Aberfeldy, Perthshire; Enniskean, Glenbower, Castle Bernard, Cork; Killarney, Kerry; Glenstale, Tipperary; Doughruagh Mt., Connemara, Galway.

Form **recta** Nyl. Lich. Scand. p. 252 (1861).—Thallus in elongated patches, often limited by a black line. Apothecia numerous, arranged in somewhat straight subparallel lines.—Cromb. Lich. Brit. p. 96; Leight. Lich. Fl. p. 365; ed. 3, p. 429; f. *betulina* Cromb. *l. c.*; f. *horizontalis* Leight. *ll. c.*

pp. 364 & 428. *Graphis Cerasi* Ach. Lich. Univ. p. 268 (1810); S. F. Gray Nat. Arr. i. p. 502. *G. scripta* var. *recta* Fr. Lich. Eur. p. 371 (1831); Mudd Man. p. 239. *G. serpentina* var. *recta* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 275 (1854); var. *horizontalis* Leight. tom. cit. p. 271. *Opegrapha recta* Humb. Fl. Friberg. p. 57 (1793). *O. betulina* Pers. in Ust. Ann. Bot. vii. p. 31 (1794). *O. Cerasi* Pers. op. cit. xi. p. 20 (1794); Engl. Bot. t. 2301.

Exsicc. Leight. n. 244; Mudd n. 217.

Easily recognized by the linear arrangements of the apothecia, which are usually rather long and narrow (f. *recta*), or slightly wider and subpruinose (f. *horizontalis*). In the specimens marked *G. Cerasi* they are mostly rather short and narrow.

Hab. On the bark of various trees.—*Distr.* Somewhat rarer, but coextensive with the species.—*B. M.* Withiel, Cornwall; Newton Bushel and Becky Falls, Devon; New Forest, Hants; St. Leonard's, Sussex; Shiere, Surrey; Epping Forest, Gosfield Woods, and Ulting, Essex; Barmouth, Merioneth; Abdon, Shropshire; Nantybelan, Denbighshire; Baysdale Gill, Cleveland, Yorkshire; Beld Craig, Moffat, Dumfriesshire; Falls of Clyde, Lanarkshire; Craigforth, Stirlingshire; near Cork.

Var. **stellata** Mudd Man. p. 239 (1861).—Thallus similar to the species. Apothecia short, rather plane and often pruinose, arranged in more or less stellate groups, and tapering towards the outer end.—f. *stellata* Leight. Lich. Fl. p. 365; ed. 3, p. 429. *Graphis serpentina* var. *stellata* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 273 (1854).

Exsicc. Mudd n. 221 (as var. *diffracta*).

Hab.—On the bark of trees.—*Distr.* Somewhat rare in S. and N. England.—*B. M.* New Forest, Hants; near Crawley, Sussex; Messing, Essex; Little Malvern, Worcestershire; Ayton, Airyholme, and Easby Wood, Cleveland, Yorkshire.

Var. **minuta** Mudd *l. c.*—Thallus similar to the species. Apothecia short, simple, straight or rarely curved, narrow, rather prominent, the margins thickish and uniform; disc usually narrow, sometimes slightly pruinose.—f. *minuta* Leight. Lich. Fl. p. 363 (1871); ed. 3, p. 428. *G. serpentina* var. *minuta* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 32 (1854).

Distr. Rare in S. and N. England and S. Ireland.—*B. M.* St. Breock, Cornwall; Becky Falls and Ullacombe, near Bovey Tracey, Devon; near Lyndhurst, New Forest, Hants; Glynde, Sussex; Weald Hall Park, Essex; Cirencester, Gloucester; Airyholme Wood, Cleveland, Yorkshire; Brown's Demesne, Riverstown, Cork.

Var. **serpentina** Nyl. Lich. Scand. p. 252 (1861).—Thallus superficial, thickish, white or greyish, tartareous, pulverulent, determinate, or reduced to a thinnish layer. Apothecia immersed in the thallus then more or less erumpent, crowded, curved, simple or variously branched; disc rather narrow,

becoming wider, sometimes subpruinose; margins thin, elevated, often crisp and wavy, the thallus usually forming an outer white margin.—Cromb. Lich. Brit. p. 96; Leight. Lich. Fl. p. 365 (incl. ff. *eutypa, spathea* and *tremulans*); ed. 3, p. 429 (incl. ff.); vars. *radiata* (non Leight.), *spathea, tremulans, eutypa* and *diffracta* Mudd Man. pp. 238–240 (1861). *Lichen serpentinus* Ach. Lich. Suec. Prodr. p. 25 (1798). *Opegrapha serpentina* Schrad. in Schrad. Journ. Bot. 1801, i. p. 79 [1803]; Engl. Bot. t. 1755? *Graphis serpentina* Ach. Lich. Univ. p. 269 (1810) pro parte (incl. vars. *spathea* and *eutypa*, p. 270; var. *rugosa*, p. 271); S. F. Gray Nat. Arr. i. p. 502; vars. *spathea, tremulans* and *eutypa* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. pp. 273 & 274 (1854). *G. diffracta* Turn. ex Leight. *l. c.* p. 276, t. 6, f. 21 (incl. vars.).

Exsicc. Leight. nos. 22, 340; Mudd nos. 218, 219, 220, 222.

Chiefly characterized by the superficial whitish thallus, and almost specifically distinct in the extreme forms. When it is thick and tartareous with the apothecia deeply immersed it is f. *eutypa;* with a thinner thallus the apothecia become more prominent and have either rather thick straight margins (f. *spathea*) or excessively wavy and tremulous ones (f. *tremulans*). The disc is usually rather narrow, though there are intermediate forms with a wider pruinose disc that connect it with var. *pulverulenta.*

Hab.—On trees.—*Distr.* Fairly common throughout England and S. W. Ireland; rarer in Scotland.—*B. M.* Withiel, Cornwall; near Lustleigh, Torquay and Ullacombe, near Bovey Tracey, Devon; New Forest, Hants; Hurst, Balcombe and Ardingly, Sussex; Epping Forest, Gosfield, Codham Hall Woods, Hadleigh Woods and Tolleshunt d'Arcy, Messing, Essex; Abdon and near Shrewsbury, Shropshire; Malvern, Worcestershire; Yarmouth, Norfolk; Newton Wood, Ingleby Park and Airyholme Wood, Cleveland, Yorkshire; Erthig Wood, Denbighshire; near Glasgow, Lanarkshire; Castle Bernard Park, Rostellan and Ballyedmond, Cork; Torc Mt., Killarney; Killaloe, Clare; Glenstale, Tipperary.

Var. **pulverulenta** Ach. Syn. p. 82 (1814).—Thallus superficial, whitish, effuse, thinner than in the preceding species. Apothecia emerging, rather long and curved; margins thickish, elevated; disc becoming plane and pruinose.—Cromb. Lich. Brit. p. 96; Leight. Lich. Fl. p. 367 (incl. f. *radiata*); ed. 3, p. 430. *Opegrapha pulverulenta* Pers. in Ust. Ann. Bot. vii. p. 29 (1794)? *Graphis pulverulenta* Ach. Lich. Univ. p. 266 (1810); S. F. Gray Nat. Arr. i. p. 502? *G. serpentina* var. *radiata* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 272 (1854).

Exsicc. Larb. Lich. Cæsar. n. 87.

Differs from the preceding variety in the thinner thallus and in the expanded pruinose apothecia.

Hab. On trees.—*Distr.* Rare throughout the British Isles.—*B. M.* Jersey; Tregawn, Withiel, Cornwall; Lustleigh, Devon; Codham Hall, Hockleigh Woods, Tolleshunt d'Arcy and Little Waltham, Essex; near Worcester.

92. **PHÆOGRAPHIS** Muell.-Arg. in Flora lxv. p. 336 (1882). *Hymenodecton* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 279 (1854). *Chiographa* Leight. *l. c.* p. 388. (Pl. 29.)

Thallus crustaceous, thin, superficial or developed under the bark (hypophlœodal). Algal cells *Trentepohlia*. Apothecia (*lirellæ*) elongate, rarely roundish, immersed then erumpent, simple or branched; disc narrow and slit-like or expanded; proper margins prominent or disappearing; hypothecium colourless or dark-coloured; asci clavate or elongate, usually 8-spored; spores brown, or colourless then brown, elongate, pluriseptate.

Mueller's arrangement of *Graphis* and the allied genera has been followed in order to avoid confusion. Earlier generic names, with undoubted claims to consideration, have been rejected as being too vague or too restricted in definition. The two genera *Hymenodecton* and *Chiographa* were formed by Leighton to mark the difference in the formation of the outer carbonaceous wall of the apothecium: in the former the wall is continuous round the base as a thin dark layer; in the latter it is developed only at the sides (dimidiate), and the colourless hypothecium rests on the substratum. More recently Crombie and Leighton included all the species under *Graphis*.

1. **Ph. inusta** Muell.-Arg. in Flora lxv. p. 383 (1882).—Thallus greyish or whitish, thin, membranaceous, smooth or wrinkled. Apothecia black, immersed, usually rather short and broad, obtuse at the ends, simple or branched; proper margins very narrow, with a thin thalloid border; disc plane, naked or pruinose; hypothecium colourless; paraphyses slender, brownish at the slightly clavate tips; spores elongate-linear, becoming dark-brown, 5–7-septate, 0,028–38 mm. long, 0,009 mm. thick.—*Opegrapha scripta* Sm. Engl. Bot. t. 1813 (1807) (non Ach.). *Graphis inusta* Ach. Syn. p. 85 (1814); Mudd Man. p. 240 (incl. var. *vera*); Cromb. Lich. Brit. p. 97; Leight. Lich. Fl. p. 368; ed. 3, p. 431 (incl. f. *vera*). *G. Smithii* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 278, t. 6, f. 22 (1854) (incl. var. *vera*).

Exsicc. Larb. Lich. Cæsar. n. 89.

In the typical form described by Acharius (f. *vera* Leight.) the thallus is sometimes surrounded by a dark line; the apothecia are short and stellately arranged in crowded or scattered groups. It is distinguished from other British members of the genus by the distinctly dimidiate apothecia, the carbonaceous walls being developed at the sides only.

Hab. On the bark of various trees.—*Distr.* Rather rare in the Channel Islands, S. and Central England, and S. and W. Ireland, not yet recorded from Scotland.—*B. M.* Beaumont, St. Lawrence, Jersey; Withiel, Cornwall; Lustleigh and near Lidford, Devon; Kemble, Wilts; near Lyndhurst, New Forest, Hants; St. Leonard's Forest and Hurst, Sussex; Epping Forest, Hockley Woods, Hadleigh Woods, and Gosfield Hall, Essex; Hollybush Hill, Malvern, Worcestershire; Glenbower Wood, Cork; Clonmel, Tipperary.

Form **divaricata** A. L. Sm.—Thallus similar to that of the species. Apothecia more elongate and scattered, occasionally

branching at right angles.—*Graphis Smithii* vars. *elongata* and *divaricata* Leight. in Ann. & Mag. *l. c.* p. 279. *G. inusta* vars. *elongata* and *divaricata* Mudd Man. p. 240 (1861); ff. *elongata* and *divaricata* Leight. Lich. Fl. p. 369; ed. 3, p. 432.

Differs chiefly in the more elongate apothecia which are often acute at the ends.

Hab. On the bark of various trees.—*Distr.* Rare in S. and E. England.—*B. M.* Hurst, Balcombe and Newtimber Downs, Sussex; Gosfield Hall and Codham Hall, Bocking, Essex.

Var. **macularis** A. L. Sm.—Thallus whitish, usually forming rather large determinate spots on the bark. Apothecia short, rarely furcate, straight or curved, densely scattered over the thallus.—*Graphis Smithii* vars. *macularis* and *simpliciuscula* Leight. in Ann. & Mag. *l. c.* p. 279. *G. inusta* vars. *macularis* and *simpliciuscula* Mudd Man. p. 240 (1861); ff. *macularis* and *simpliciuscula* Leight. Lich. Fl. p. 369; ed. 3, p. 432.

Exsicc. Larb. Lich. Cæsar. n. 90; Leight. n. 285.

Hab. On the bark of various trees.—*Distr.* More frequent than the species in the same localities and also in Wales.—*B. M.* Rozel, Jersey; Withiel, Cornwall; Torquay, Devon; I. of Wight and Lyndhurst, New Forest, Hants; St. Leonard's Forest and Glynde, Sussex; Penshurst, Kent; Braydon Forest, Wilts; Epping Forest, Hadleigh Woods, Codham Hall, Messing, and Barking, Essex; Malvern, Worcestershire; Barmouth, Merioneth; Bettws-y-Coed, Carnarvonshire; Glenmire and near Cork; Killarney, Kerry; Loughcooter, Galway.

2. **Ph. dendritica** Muell.-Arg. in Flora lxv. p. 382 (1882).—Thallus white or greyish, thin or rather thick, more or less wrinkled (K + yellow then red). Apothecia somewhat variable, long or short, acute at the ends, or almost round, brownish-black, immersed, scattered, curved or straight and sparingly branched towards the centre of the thallus, usually branched and radiating at the circumference; disc rather broad and flat, pruinose, with thin margins, the thallus forming a white pseudomargin; perithecial wall continuous as a thin line under the base; paraphyses closely conglutinate, inspersed with small granules, slightly swollen and brown at the tips; spores elongate, colourless then brown, 7–8-septate, 0,042–48 mm. long, 0,009–12 mm. thick.—*Opegrapha dendritica* Ach. Meth. p. 31, t. 1, f. 10 (1803); Engl. Bot. t. 1756; Hook. in Sm. Engl. Fl. v. p. 147; Tayl. in Mackay Fl. Hib. ii. p. 106. *Graphis dendritica* Ach. Lich. Univ. p. 271 (1810). S. F. Gray Nat. Arr. i. p. 503; Mudd Man. p. 241; Cromb. Lich. Brit. p. 97; Leight. Lich. Fl. p. 367; ed. 3, p. 431 (incl. ff. *Smithii* and *acuta*). *Hymenodecton dendriticum* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 387, t. 7, f. 23 (1854) (incl. vars. *Smithii & acuta*).

Exsicc. Larb. Lich. Cæsar. n. 41; Carroll Lich. Hib. n. 11.

Well differentiated by the whitish well-developed thallus and the dendroid branching of the lirellæ. Among the forms distinguished by

Leighton, *Smithii* is marked by the more deeply-immersed apothecia which branch at an obtuse angle, in this respect differing from f. *acuta* in which the angle is acute. Usually the carbonaceous wall is thinly developed at the base of the apothecium, but in some forms it is thicker, and occasionally there is a gap, observable in section with the microscope, causing the apothecium to appear semidimidiate.

Hab. On trees.—*Distr.* In wooded regions, chiefly in S. England and S. Ireland.—*B. M.* Guernsey; Rozel, Jersey; Hustyn Wood, Bodmin, Cornwall; Carisbrooke, and near Shanklin, I. of Wight; Totnes, Torquay, near Becky Falls, Ivy Bridge and Ullacombe, Devon; Southton Common, Somerset; Stoney Cross, near Bartley Lodge, Brockenhurst, and near Lyndhurst, New Forest, Hants; Ardingly, St. Leonard's, Tunbridge Wells, Tilgate, Danny, Charlton, near Brighton, and Buckhurst Park, Sussex; near Penshurst, Kent; Shiere, Surrey; Little Waltham, Pod's Wood, Messing and Epping Forest, Essex; Craigforda, Shropshire; near Malvern, Worcestershire; near Dolgelly and Yns-faig, near Barmouth, Merioneth; Castle Bernard Park, Bandon, Riverstown and Rostellan, Cork; Killarney, Kerry.

Form **obtusa** A. L. Sm.—Apothecia rounded and obtuse at the ends, frequently furcate or sparingly branched, almost superficial, the thalloidal margin almost disappearing.—*Hymenodecton dendriticum* var. *obtusa* Leight. tom. cit. p. 388. *Graphis dendritica* f. *obtusa* Leight. Lich. Fl. p. 368; ed. 3, p. 431.

A distinctive form owing to the rather crowded and short blunt superficial lirellæ. Leighton notes branching at an obtuse angle as characteristic, but the branches form quite as frequently a right angle with the main apothecium.

Hab. On trees.—*Distr.* Rather rare, but coextensive with the species.—*B. M.* Torquay and near Ilsington, Devon; Kemble, Wilts; Castle Bernard, Cork; Cromaglown, Killarney, Kerry.

3. **Ph. Lyellii** A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, p. 99 (1905).—Thallus thin, membranaceous, smooth, pale-olive or rather dark (K + yellowish). Apothecia brownish-black, sessile, oblong or linear-oblong, straight or curved, simple or sparingly branched; proper margins thin, the thallus forming a prominent white pulverulent border; disc broad, plane, pruinose; hypothecium dark and carbonaceous; paraphyses inspersed with small granules, slightly swollen and dark at the tips, somewhat conglutinate; spores elongate-linear, 5–7-septate, brownish, becoming dark, 0,017–33 mm. long, 0,006–8 mm. thick.—*Opegrapha Lyellii* Sm. Engl. Bot. t. 1876 (1808); Hook. in Sm. Engl. Fl. v. p. 147. *Graphis Lyellii* Ach. Syn. pl. 85 (1814); S. F. Gray Nat. Arr. i. p. 503; Mudd Man. p. 241; Cromb. Lich. Brit. p. 97; Leight. Lich. Fl. p. 369; ed. 3, p. 432. *Chiographa Lyellii* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 388, t. 7, f. 24 (1854).

Exsicc. Carroll Lich. Hib. n. 12; Cromb. n. 194.

Distinguished from the preceding species by the well-developed carbonaceous base of the apothecia.

Hab. On trees.—*Distr.* Rare in the Channel Islands, S. England and S. Ireland.—*B. M.* Guernsey; Withiel and near Liskeard, Cornwall; Cury Park, near Lew Trenchard and Harpford, Devon; near Ringwood and near Lyndhurst, New Forest, Hants; Castle Bernard Park, Bandon, Castlemartyr, Brown's Demesne, Riverstown, Carrigaline, and near Crosshaven, Cork.

93. **GRAPHINA** Muell.-Arg. in Flora lxiii. p. 22 (1880). *Stenographa* Mudd Man. p. 235. (Pl. 30.)

Thallus crustaceous, thin, superficial or developed under the bark. Algal cells *Trentepohlia*. Apothecia (*lirellæ*) elongate, immersed in the thallus or superficial, simple or branched; disc narrow and slit-like; proper margins tumid, prominent, furrowed or simple; hypothecium colourless or dark-coloured; asci clavate or elongate, usually 8-spored; spores rather large, colourless, muriform.

Distinguished by the muriform colourless spores. As stated already, the earlier *Stenographa* of Mudd, though practically a synonym of *Graphina*, has been rejected in favour of the latter which is founded on characters recognized as more truly of generic importance, and which occupies a definite position in Mueller's scheme. *Phæographina* Muell. Arg. with brown muriform spores is not represented in Great Britain.

1. **Gr. anguina** Muell.-Arg. in Flora lxv. p. 385 (1882).—Thallus effuse or determinate, whitish or pale-yellowish, thin, membranaceous or thickish, tartareous, minutely warted and wrinkled. Apothecia generally crowded, variable in size and direction, simple or branched, straight or curved; disc slit-like, narrow, sometimes slightly dilated and tapering towards the ends; proper margins narrow or tumid, elevated, simple, closely surrounded and often surmounted by the thallus; hypothecium colourless or pale-brownish, the apothecial wall developed at the sides (dimidiate); paraphyses slender, somewhat conglutinate; epithecium dark-brown; spores large, colourless, muriform, 0,030–75 mm. long, 0,015–20 mm. thick.—*Ustalia anguina* Mont. in Ann. Sci. Nat. sér. 2, xviii. p. 278 (1842). *Graphis scripta* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 264, t. 6, f. 17 (1854) (non Ach.). *G. anguina* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 395 (1856). *G. sophistica* Nyl. ex Cromb. Lich. Brit. p. 96 (1870) (non Nyl. in Act. Soc. Sci. Fenn. vii. p. 465 (1863)); Leight. Lich. Fl. p. 370; ed. 3, p. 434 (incl. f. *diffusa*). *Stenographa anguina* Mudd Man. p. 235 (1861) (incl. vars. *diffusa* and *divaricata*).

Exsicc. Bohl. n. 28 (as *Opegrapha scripta*); Mudd n. 216 (as *Stenographa anguina* var. *divaricata*).

The thallus varies from being thin and yellowish to a somewhat thickish, light-coloured, finely-warted membrane. The apothecia are emergent, more or less prominent and dark-coloured, the disc being narrow and rarely slightly pruinose. The name *sophistica*

was given by Nylander to a species of the same genus from New Granada, with somewhat similar spores, but with the margins of the apothecia distinctly furrowed; it does not occur in Great Britain.

Hab. On trees in wooded regions.—*Distr.* Frequent in England, more especially in the Southern Counties and in S. and W. Ireland, rare in Scotland.—*B. M.* Gwiney Moor, Cornwall; Balcombe and St. Leonard's Forest, Sussex; Bath, Somerset; Church Stretton, Shropshire; Gosfield, Hadleigh and Hockley Woods, Essex; King's Wood, Roche Abbey, Airyholme Wood and Kildale, Cleveland, Yorkshire; near Corwen, Carnarvonshire; Inishannon and Castle Bernard, Cork; Clonmell, Tipperary; McCarthy's Island, Killarney, Kerry; Doughruagh Mts., Connemara, Galway.

Form **radiata** A. L. Sm.—Thallus as in the species. Apothecia rather short, arranged in stellate radiate groups; disc narrow, tapering towards the ends, rarely slightly pruinose.—*Graphis scripta* var *radiata* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 266 (1854). *Stenographa anguina* var. *radiata* Mudd Man. p. 236 (1861). *Graphis sophistica* f. *radiata* Leight. Lich. Fl. p. 371 (1871); ed. 3, p. 434.

Exsicc. Mudd n. 215; Leight. n. 339.

Hab. On trees.—*Distr.* Somewhat rare, but co-extensive with the species.—*B. M.* Gosfield, Chalkeney Woods and Hadleigh Woods, Essex; Gwydir Woods and Gloddaeth Woods, Conway, Carnarvonshire; Hoggart's Wood, Ingleby, Yorkshire; Ballyedmond, Cork.

Var. **pulverulenta** A. L. Sm.—Thallus thicker and whiter than in the species, tartareous, and generally pulverulent, especially near the apothecia, effuse or in definite roundish patches. Apothecia more deeply immersed, lying in all directions, flexuose, simple or branched, disc narrow or dilated and often whitish-pruinose, tapering towards the ends.—*Opegrapha pulverulenta* Sm. Engl. Bot. t. 1754 (1807)? (excl syn.) (non Pers.). *Graphis scripta* vars. *flexuosa* and *divaricata* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. pp. 265, 266 (1854). *G. pulverulenta* Leight. tom. cit. p. 268. t. 6. f. 18. *G. sophistica* ff. *flexuosa* and *divaricata*; var. *pulverulenta* Leight. Lich. Fl. p. 371 (1871); ed. 3, p. 434; var. *dendriticoides* Leight. *l. c.* p. 435 (1879). *Stenographa anguina* vars. *flexuosa* and *pulverulenta* Mudd Man. p. 236 (1861).

Exsicc. Leight. n. 18 (as *Graphis scripta* var. *flexuosa*), n. 19 pro parte (as *G. scripta* var. *divaricata*), n. 20 as *G. pulverulenta*; Larb. Lich. Hb. n. 236.

Differs from the species, more particularly in the character of the thallus, which is often very pulverulent. The apothecia are usually narrow, as in the species, but frequently become dilated and pruinose. Smith's figure of *Opegrapha pulverulenta* in Engl. Bot. closely resembles the outward aspect of the plant, but I have been unable to find a specimen in his herbarium to verify the internal structure.

Hab. On trees in wooded regions.—*Distr.* Somewhat frequent in the S. of England and in S. and W. Ireland, rarer in N. England and Wales, evidently not yet found in Scotland.—*B. M.* Lyndhurst, New

Forest, and I. of Wight, Hants; Tilgate, Ardingly and Balcombe, Sussex; Hadleigh and Hockley Woods, Messing, Stansted Mountfitchet and Epping Forest, Essex; Gloddaeth, near Conway and Gwydir Woods, Bettws-y-Coed, Carnarvonshire; Holly Park, near Stokesay, Shropshire; Newton Wood and Ayton, Cleveland, Yorkshire; Crosshaven, Cork; Castleconnel, Limerick; Killaloe, Clare; Killarney, Kerry; near Clifden, Connemara, Galway.

2. **Gr. inustula** A. L. Sm.—Thallus thin, white, slightly warted and wrinkled, subdeterminate (K + yellow). Apothecia immersed, thinly scattered, short, obtuse, simple or branched; disc broad, plane, whitish-pruinose, proper margins thin, elevated; hypothecium colourless, the apothecial walls lateral only; paraphyses slender, subdiscrete; epithecium blackish-brown; spores muriform, colourless, 0,035–48 mm. long, 0,012–20 mm. thick.—*Graphis inustula* Nyl. in Flora lx. p. 566 (1877); Cromb. in Grevillea vi. p. 114; Leight. Lich. Fl. ed. 3, p. 435.

Exsicc. Larb. Lich. Hb. without a number.

Differs from the preceding species in the flat short pruinose apothecia which somewhat resemble those of *Phœographis inusta*.

Hab. On holly.—*B. M.* Westport, Mayo (the only locality).

3. **Gr. Ruiziana** Muell.-Arg. in Flora lxiii. p. 20 (1880).—Thallus greyish-cream-coloured, thin, smooth, determinate or effuse, sometimes limited by a black line. Apothecia black, prominent, sessile or slightly immersed at the base, linear-oblong, rather short, straight or subflexuose; usually simple; disc narrow, sometimes slightly dilated; proper margins tumid, connivent; hypothecium blackish-brown, the apothecial wall continuous under the base; paraphyses slender, conglutinate; epithecium blackish-brown; spores oblong-ovoid, colourless, 0,030–45 mm. long, 0,010–18 mm. thick.—*Opegrapha Ruiziana* Fée Ess. Crypt. p. 27 (1824). *O. anomala* Leight. in Ann. Mag. Hist. ser. 2, xix. p. 129, t. 8, figs. 1–6 (1857). *Stenographa anomala* Mudd Man. p. 236 (1861). *Graphis Ruiziana* Nyl. in Act. Soc. Sci. Fenn. vii. p. 464 (1863); Carroll in Journ. Bot. iii. p. 291 (1865); Cromb. Lich. Brit. p. 96; Leight. Lich. Fl. p. 370; ed. 3, p. 433.

Exsicc. Cromb. n. 193.

Hab. On bark.—*Distr.* Not uncommon in S., W., and Central England, Wales, and S. and W. Ireland.—*B. M.* St. Breock, Wadebridge, and near Bodmin, Cornwall; Ivybridge and Ilsham, Torquay, Devon; Lymington, Hants; Malvern, Worcestershire; Dolgelly, Merioneth, Glenbower, Glengariff, and Castlemartyr, Cork; Torc Mt., Croghan, and Cromaglown, Killarney.

CHIODECTONACEÆ.

Thallus crustaceous. Algal cells usually *Trentepohlia*. Apothecia aggregate in specialized prominent stroma-like portions of the thallus (verrucæ), deeply immersed, immarginate, small and punctiform or elongate; asci elongate-clavate; spores elongate, pluriseptate.

Characterized by the differentiation of the thallus and by the arrangement and form of the apothecia. The order is well-represented in tropical countries; in Great Britain there are only a few species which are contained in the following genera:—

Apothecia immarginate.
Hypothecium colourless or thinly black.
Spores colourless ..... 94. **Enterographa.**
Spores brown ..... 95. **Sclerophyton.**
Hypothecium thick and black..... ..... 96. **Chiodecton.**
Apothecia marginate..... ..... 97. **Glyphis.**

94. **ENTEROGRAPHA** Fée Ess. Crypt. p. xxxii. (1824). *Stigmatidium* Meyer Entw. Met. Fortpfl. Flecht. p. 328 (1825). *Platygramma* Leight. in Ann. Mag. Nat. Hist. ser. 2. xiii. p. 393 (1854) pro parte (non Meyer). (Pl. 31.)

Thallus crustaceous, thickish, limited by a black hypothallus. Algal cells *Trentepohlia*. Apothecia aggregate or contiguous in lines or solitary, roundish or shortly elongate, immarginate, deeply immersed in the verrucæ; hypothecium colourless or thinly black; paraphyses slender, branched; asci clavate, 8-spored; spores elongate-fusiform, colourless, pluriseptate. Spermogones with cylindrical elongate or elliptical straight or bent spermatia.

The deeply immersed fructifications are occasionally somewhat perithecial-like in form and structure, especially when the disc is contracted to a small opening. The graphideine character is more apparent in those species that have elongate apothecia.

1. **E. crassa** Fée *op. cit.* pp. xxxii. & xc. t. 1, f. 6 (1824).—Thallus thick, greyish-white, olivaceous or brownish, smooth and polished, becoming somewhat cracked, limited and often intersected by the blackish hypothallus; the verrucæ flat, wide-spreading not prominent. Apothecia brownish-black, minute, numerous, punctiform, solitary or aggregate in flexuose lines, or in small groups, deeply immersed in the thallus, immarginate; hypothecium colourless; spores fusiform-elongate, 5–7-septate, 0,024–35 mm. long, 0,005 mm. thick; spermogones with short rod-like spermatia 0,004–5 mm. long, 0,001 mm. thick.—*Opegrapha crassa* DC. Fl. Franc. ii. p. 312 (1805). *Lichen obscurus* Sm. Engl. Bot. t. 1752 (1807) pro parte (non Ach.). *Stigmatidium crassum* Dub. Bot. Gall. ii. p. 643 (1830); Mudd Man. p. 245;

Cromb. Lich. Brit. p. 101; Leight. Lich. Fl. p. 389; ed. 3, p. 412. *Porina aggregata* Ach. Syn. p. 112 (1814) fide Fries. *Sagedia aggregata* Fr. Lich. Eur. p. 416 (1831); Leight. Angioc. Lich. p. 24, t. 8, f. 1. *Pertusaria crassa* Hook. in Sm. Engl. Fl. v. p. 160 (1833). *Verrucaria obscura* Tayl. in Mackay Fl. Hib. ii. p. 96 (1836).

Exsicc. Leight. nos. 69, 96 (as *Sagedia aggregata* var. *venosa*); Mudd n. 224; Larb. Lich. Hb. nos. 115, 276 & Lich. Cæsar. n. 45.

Hab. On trunks of somewhat old trees in wooded regions.—*Distr.* Fairly common in the Channel Islands and throughout England, more especially in the southern counties, and in S. and W. Ireland, rare in S. and W. Scotland.—*B. M.* Guernsey; Ann Port, Jersey; Shanklin and near Ryde, I. of Wight; Whitesand Bay and Withiel, Cornwall; Plymouth, and near Totnes, Devon; New Forest and Lymington, Hants; St. Leonard's Forest, Clayton, Woolsonbury, Arundel, and Fairlight, Hastings, Sussex; Coldharbour, Surrey; Wrotham, Kent; Epping Forest, Gosfield Hall, Hockley Woods, and Rayleigh, Essex; Cirencester, Gloucestershire; Great Glenham, Suffolk; near Norton and near Malvern, Worcestershire; near Shrewsbury, Shropshire; Gloddaeth, near Conway and Llanbedrog, Carnarvonshire; Gopsall and Twycross, Leicestershire; near Nottingham; Westerdale, Cleveland, Yorkshire; Barcaldine, Argyll; Castle Bernard Park, Bandon, Castlemary, and near Queenstown, Cork; Killarney, Kerry; Glenstale, Tipperary; Dromoland, Clare; Glen Inagh and Derryclare, Connemara, Galway.

Form **saxicola** Cromb. in Herb.—Differs in the somewhat thicker and more distinctly areolate thallus, the hypothallus is also less marked.

Exsicc. Larb. Lich. Hb. n. 115 & Lich. Cæsar. n. 46.

Hab. On rocks.—*Distr.* Rather rare in the Channel Islands, S. England and W. Ireland.—*B. M.* Port Gorey, Sark; Noirmont and La Coupe, Jersey; Whitesand Bay, Cornwall; near Plymouth, Devon; Derryclare, Connemara.

2. **E. Hutchinsiæ** Koerb. Parerg. Lich. p. 259 (1861).—Thallus crustaceous, rather thin, dull-pale-yellow or brownish, minutely cracked into areolæ, limited by the black hypothallus; the verrucæ small, scattered, flat. Apothecia variable in form, minute, oblong and sometimes round, straight or curved, sometimes branched, plane, immarginate but with a lateral wall which traverses the base as a thin black line; spores fusiform elongate, 5–7- or pluri-septate, 0,025–30 mm. long, 0,004 mm. thick.—*Platygramma Hutchinsiæ* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 393, t. 7, f. 28 (1854). *Stigmatidium Hutchinsiæ* Nyl. in Mém. Soc. Sci. Nat. Cherb. v. p. 132 (1857); Mudd Man. p. 243; Cromb. Lich. Brit. p. 101; Leight. Lich. Fl. p. 390; ed. 3, p. 413.

Exsicc. Leight. n. 130; Mudd nos. 225, 226 (corticolous); Larb. Lich. Hb. n. 116.

Distinguished by the thinner more continuous thallus and by the scattered minute fertile verrucæ.

Hab. On shaded rocks, rarely on trees.—*Distr.* Rather rare in the Channel Islands, S. and N. England, and S. and W. Ireland, not recorded from Scotland.—*B. M.* St. Peter's Valley, Jersey; near Launceston, near Penzance and Whitesand Bay, Cornwall; near Plymouth, Devon; Edderton Wood, Montgomeryshire; Bettws-y-Coed, Carnarvonshire; Kildale and Newton Rocks, Cleveland, Yorkshire; Dunscombe's Wood, Cork; Muckruss Demesne and Dinish Island, Killarney, Kerry; Killery Bay and Derryclare, Connemara, Galway.

3. **E. venosa** Massal. in Verh. K. K. Zool.-Bot. Ges. Wien, x. p. 679 (1860).—Thallus tartareous, dirty-cream-coloured, smooth, continuous in turgescent patches, limited by a black line; verrucæ thickish, spreading. Apothecia shortly elongate, innate, slender, variously branched and curved, immarginate, internally pale; spores elongate-acicular, up to 13-septate, 0,038–44 mm. long, 0,003 mm. thick.—*Opegrapha venosa* Sm. Engl. Bot. t. 2454 (1812) (non Pers.); Hook. in Sm. Engl. Fl. v. p. 148. *Platygramma elaborata* Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 394, t. 7, f. 27 (1854). *Stigmatidium venosum* Nyl. in Mém. Soc. Sci. Cherb. v. p. 132 (1857); Mudd Man. p. 244; Cromb. Lich. Brit. p. 101; Leight. Lich. Fl. p. 390; ed. 3, p. 413.

Characterized by the elongate apothecia and the multiseptate spores.

Hab. On old trees.—*Distr.* Rare in S. England and S. Ireland.—*B. M.* Near Ryde, I. of Wight; New Forest, Hants; Glenstale, Tipperary.

95. **SCLEROPHYTON** Eschw. Syst. Lich. p. 14, f. 8 (1824) fide A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, p. 105 (1905). *Stigmatella* Mudd Man. p. 252 (1861). (Pl. 34.)

Thallus crustaceous. Algal cells *Trentepohlia*. Apothecia roundish or elongate, deeply immersed, thickly grouped, often confluent; hypothecium clear or colourless; paraphyses slender, branched; asci clavate, 8-spored; spores elongate-clavate or fusiform, brown, pluriseptate.

Well characterized by the brown spores. The spermogones and spermatia are similar to those of *Enterographa*.

1. **S. circumscriptum** A. Zahlbr. *l. c.*—Thallus glaucous-white, thick, tartareous, irregularly cracked, at first limited by a narrow line, becoming subdeterminate or effuse. Apothecia minute, punctiform, crowded into small patches, solitary or confluent in narrow lines, arranged in a dendroid manner towards the circumference; disc plane or slightly convex, naked or pruinose; spores elongate-clavate, dark-brown, 4–7-septate, 0,020–25 mm. long, 0,005 mm. thick.—*Verrucaria circumscripta* Tayl. in Mackay Fl. Hib. ii. p. 96 (1836). *Sagedia circumscripta* Leight. Angioc. Lich. p. 24, t. 8, fig. 2 (1851). *Stigmatella circum-*

scripta Mudd Man. p. 253 (1861). *Stigmatidium circumscriptum* Carroll in Journ. Bot. iii. p. 291 (1865); Cromb. Lich. Brit. p. 101; Leight. Lich. Fl. p. 389; ed. 3, p. 412; f. *dendrizum* Nyl. in Flora lxiv. p. 188 (1881).

Exsicc. Mudd n. 239; Larb. Lich. Hb. nos. 319, 320.

The fertile verrucæ are not distinguishable from the thick, deeply cracked thallus. The arrangement of the apothecia is very varied; usually they are irregularly scattered, sparse, and very crowded towards the centre of the thallus and arranged in dendroid radiating lines at the circumference (f. *dendrizum*), a character which is fairly constant in well-developed specimens.

Hab. On shaded rocks, not calcareous, usually near the sea.—*Distr.* Not uncommon in the Channel Islands and S. England; rare in N. England and S. and N. Ireland.—*B. M.* Jerbourg, Guernsey; Boulay Bay, Rozel, La Coupe, Belmonte Bay and Noirmont, Jersey; Pentire, St. Minver, Willcoe, Saltash, St. Peter's Point and Banks of the Tamar, Cornwall; Lynmouth and Lydford, Devon; Airyholme Wood, Cleveland, Yorkshire; Killarney, Kerry.

96. **CHIODECTON** Ach. Syn. Lich. p. 108 (1814). *Syncesia* Tayl. in Mackay Fl. Hib. ii. p. 103 (1836). (Pl. 32.)

Thallus crustaceous, thin or often rather thick. Algal cells *Trentepohlia*. Apothecia black, immersed in the thalline verrucæ, aggregate or confluent; hypothecium thick, blackish-brown; paraphyses slender, branched; asci clavate; spores elongate-fusiform, 2–pluri-septate, colourless. Spermogones with cylindrical straight or bent spermatia.

Distinguished from other genera of the order by the deep black stromatoid structure of the hypothecium which often connects the apothecia at the base.

1. **C. albidum** Leight. Angioc. Lich. p. 25, t. 8, f. 4 & t. 9, f. 1 (1851).—Thallus whitish, thin, pulverulent, dotted with white elevated roundish verrucæ. Apothecia small, immersed in the verrucæ, substellate, or solitary, confluent at the base in a black stroma forming the hypothecium; paraphyses slender, distinct; spores fusiform, colourless, 3-septate, 0,030–40 mm. long, 0,005–6 mm. thick.—Leight. Lich. Fl. p. 404; ed. 3, p. 435 (excl. vars.). *C. myrticola* var. *albidum* Mudd Man. p. 245 (1861); Cromb. Lich. Brit. p. 105. *Syncesia albida* Tayl. in Mackay Fl. Hib. ii. p. 103 (1836).

Hab. On shaded rocks.—*Distr.* Rare in S. and N. Ireland.—*B. M.* Dunkerron, and between Kenmare and Killarney, Kerry.

2. **C. petræum** Del. ex Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 418 (1856).—Thallus white, cretaceous, rather thick, and lumpy or warted, smooth. Apothecia immersed in the verrucæ, crowded or confluent, flat and somewhat depressed, whitish-pruinose; paraphyses slender, distinct, spores elongate-fusiform,

3-septate, 0,030–40 mm. long, 0,003 mm. thick.—*C. sarniense* Salw. ex Mudd Man. p. 245 (1861). *C. albidum* var. *sarniense* Mudd *l. c.*; Leight. Lich. Fl. p. 404; ed. 3, p. 435. *C. myrticola* var. *sarniense* Cromb. Lich. Brit. p. 105 (1870).

Exsicc. Larb. Lich. Hb. n. 356.

Hab. On maritime rocks.—*Distr.* Rare in the Channel Islands and S. England.—*B. M.* I. of Bréchou; Sark; Alderney; Jerbourg, Guernsey; Boulay Bay, Jersey; Pentire, St. Minver, Cornwall.

3. **C. myrticola** Fée Ess. Crypt. i. p. 63, t. 18, f. 1 (1824).—Thallus effuse, white or yellowish, somewhat granular or mealy, with scattered raised roundish flat verrucæ. Apothecia immersed in the verrucæ, black, small, punctiform, angular or flexuose, often confluent, base confluent, blackish-brown; spores elongate-fusiform, slightly bent, colourless, 2- or 3- (?) septate, 0,036–48 mm. long, 0,004 mm. thick.—Leight. Angioc. Lich. p. 25, t. 8, f. 3?

Essentially an inhabitant of southern lands (S. France, &c.). The only specimen in the British Museum is imperfectly developed, and it has been impossible to find spores; it agrees externally with the diagnosis given for the species.

Hab. On bark of myrtle and heath.—*B. M.* Killarney, Kerry.

4. **C. subdiscordans** Nyl. in Flora lxii. p. 221 (1879).—Thallus whitish, thin, granular, continuous, with small roundish verrucæ. Apothecia black, aggregate in the verrucæ; hypothecium blackish; paraphyses not distinct, spores oblong-clavate, 3-septate, 0,011–16 mm. long, 0,0035 mm. thick, rather thicker upwards; hymenial gelatine bluish, then sordid-yellow with iodine.—Cromb. in Grevillea viii. p. 29.

Hab. On moist rocks.—*B. M.* Above Lough Feagh, Connemara, Galway.

97. **GLYPHIS** Ach. Syn. p. 106 (1816). (Pl. 33.)

Thallus crustaceous. Algal cells *Trentepohlia*. Apothecia immersed in more or less prominent verrucæ, roundish or elongate, simple or branched; apothecial wall well-developed, forming a dark margin; paraphyses simple; asci elongate, 4–8-spored, rather thickened at the tips; spores elongate, pluriseptate, colourless.

Essentially a tropical genus only sparingly represented in Europe. Owing to the elongate apothecia it is perhaps more characteristically graphideine than the other genera of the order. The spermogones are unknown.

1. **G. labyrinthica** Ach. Syn. p. 107 & in Trans. Linn. Soc. xii. p. 38, t. 2, f. 1 (1818).—Thallus whitish or brownish-olivaceous, thin, with white rather flat subprominent pulverulent verrucæ. Apothecia small, elongate, forming a reticulation of black lines on the verrucæ; hypothecium brownish, darker

downwards; paraphyses slender, crowded, rather indistinct; spores linear-oblong, 3–5-septate, becoming slightly brownish.—Leight. in Trans. Linn. Soc. xxvii. p. 181, t. 36, f. 68 (1870) & Lich. Fl. p. 403; ed. 3, p. 436; Cromb. in Journ. Bot. ix. p. 179 (1871).

Hab. On trees or on wood, very rare.—*B. M.* Killarney, Kerry.

Series VI. PYRENODEI.

Thallus foliaceous, squamulose or crustaceous, sometimes developed under the bark (hypophlœdal), or wanting. Algal cells Cyanophyceæ or Chlorophyceæ. Fruiting body a roundish perithecium immersed or superficial, usually opening above by a pore (*ostiole*).

The series is marked by the character of the fruits resembling that of the Pyrenomycetes among fungi. The genus *Strigula* (see Part I. p. 12) is omitted, as the only British species referred to it, *Str. Babingtonii*, is a fungus. The genera classified by Crombie (*l. c.*), under Ser. vii. *Peridiodei*, have also been included under *Pyrenodei*, with the exception of the genus *Endococcus*, which is now recognized as consisting of species of fungi parasitic on the thallus and fruits of various Lichens.

Myriangium (Family IV. Myriangiacei) (see Part I. p. 15) is also now regarded as a genus of Fungi.

Tribe XX. PYRENOCARPEI.

Thallus foliaceous, squamulose or variously crustaceous, sometimes obsolete. Perithecia immersed in the thallus or more or less superficial, scattered or united in a stroma, the outer wall soft and waxy or carbonaceous; contents soft and mucilaginous, often interspersed with oil-drops, sometimes enclosing hymenial gonidia; paraphyses simple or branched, sometimes disappearing or altogether wanting.

With the exception of the Order Pyrenidiaceæ (Tribe iii. *Pyrenidiei*, Part I. pp. 3, 81), the lichens of this tribe contain gonidia belonging to the group of green Algæ, Chlorophyceæ. The Order Astrotheliaceæ is not represented in the British Isles. *Astrothelium parmularia* Leight. Lich. Fl. p. 467; ed. 3, p. 499 (*Sphœria parmularia* Berk. in Hook. Journ. Bot. iii. p. 19 (1851)) is a fungus.

The following Natural Orders are British:—

PYRENIDIACEÆ.—Thallus squamulose or crustaceous, sometimes corticated. Algal cells (*gonimia*) Cyanophyceæ. Perithecia simple with an apical ostiole.

DERMATOCARPACEÆ.—Thallus foliaceous, squamulose or crustaceous, often corticated on one or both surfaces. Algal cells (*gonidia*) *Palmella*. Perithecia simple with an apical ostiole.

VERRUCARIACEÆ.—Thallus variously crustaceous, not corticated. Algal cells (*gonidia*) *Pleurococcus* or *Palmella*. Perithecia simple with an apical ostiole.

PYRENULACEÆ.—Thallus variously crustaceous, not corticated. Algal cells (*gonidia*) *Trentepohlia*. Perithecia simple with an apical ostiole.

THELOCARPACEÆ.—Horizontal thallus wanting. Algal cells (*gonidia*) *Pleurococcus*. Perithecia simple, surrounded by a gonidial sheath.

TRYPETHELEACEÆ.—Thallus crustaceous or almost obsolete, not corticated. Algal cells (*gonidia*) *Trentepohlia*. Perithecia united in a common stroma.

MYCOPORACEÆ.—Thallus crustaceous or almost obsolete, not corticated. Algal cells (*gonidia*) *Palmella* or *Trentepohlia*. Perithecia united under a common peridium with imperfectly developed perithecial walls.

PYRENIDIACEÆ.

Thallus squamulose, minutely shrubby or crustaceous. Algal cells (*gonimia*) Cyanophyceæ. Perithecia simple, innate or superficial; spores 4–8 in the ascus, simple or septate, colourless or coloured.

The Order includes the genus *Pyrenidium* already described (Part I. p. 81), and three other genera:—

Thallus squamulose; perithecia wanting..... 98. **Coriscium.**
(Thallus shrubby; perithecia scattered ..... 19. **Pyrenidium.**)
Thallus crustaceous; perithecia congregate in a pseudostroma ..... 99. **Lophothelium.**
Thallus wanting; perithecia parasitic ..... 100. **Obryzum.**

98. **CORISCIUM** Wainio Lich. Brésil ii. p. 188 (1890). (Pl. 35.)

Thallus squamulose, upper surface corticated, lower surface of loose straggling hyphæ. Algal cells *Microcystis* (*Polycoccus* Kütz.) occurring in compact, closely crowded groups, which are surrounded and penetrated by the fungal hyphæ. Perithecia and spermogones unknown.

Distinguished by the nature of the algal cells (*gonimia*).

1. **C. viride** A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, p. 77 (1903).—Thallus bright bluish-green, squamulose or lobed and sinuate, somewhat imbricate, closely adhering to the substratum, but rather concave with the margins raised, under surface white, without rhizinæ.—*Endocarpon viride* Ach. Lich.

Univ. p. 300 (1810). *E. laetevirens* Turn. ex Hook. in Sm. Engl. Fl. v. p. 158 (1833); Tayl. in Mackay Fl. Hib. ii. p. 101; Leight. Angioc. Lich. p. 12. *Verrucaria laetevirens* Borr. in Engl. Bot. Suppl. t. 2658 (1830). *Normandina viridis* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 420 (1856); Mudd Man. p. 269. *N. laetevirens* Nyl. Lich. Scand. p. 264 (1861); Cromb. Lich. Brit. p. 107; Leight. Lich. Fl. p. 408; ed. 3, p. 440.

Exsicc. Leight. n. 25; Mudd n. 258.

Hab. On turfy soil, on mosses in bogs, etc.—*Distr.* Somewhat frequent in the Channel Islands and throughout England and Wales, among the Grampians, Scotland and in Ireland.—*B. M.* Guernsey; Helmen Tor, Cornwall; Ardingly Rocks, Tunbridge Wells and Maresfield, Sussex; Esher, Surrey; Hungershall Rocks, Kent; Oswestry, Shropshire; Barmouth, Arran Penthyn and Cwm Bychan, Merioneth; Aber, Carnedd Dafydd, and Sychnant near Conway, Carnarvonshire; Black Edge near Buxton, Derbyshire; Broughton Bank and Ingleby Moor, Cleveland, Yorkshire; Teesdale, Durham; Ben Ledi and Ben Lawers, Perthshire; Doneraile Mt., Cork; Mangerton, Kerry; Connemara, Galway.

99. **LOPHOTHELIUM** Stirton in Scott. Nat. ix. p. 37 (1887).

Thallus crustaceous. Algal cells Cyanophyceæ (*Nostoc*?). Perithecia immersed in prominent tubercles; paraphyses distinct, soft; spores 8 in the ascus, septate, brown.

Included in this Natural Order on account of the blue-green gonimia, but possibly with quite other affinities. In the absence of specimens it is impossible to do more than suggest the classification. Stirton himself considers that the tubercles indicate some connection with Trypetheliaceæ, or might be in the nature of parasites on other lichens. Stirton states that they are colourless internally, no gonidia or gonimia being found in them.

1. **L. acervatum** Stirton *tom. cit.* p. 39.—Thallus crustaceous, thickish, dark-brown, minutely wrinkled, sprinkled with whitish cephalodia resembling the phyllocladia of *Stereocaulon*, and containing greenish-yellow algal cells. Fertile tubercles numerous, pale-coloured, up to 1 mm. across; perithecia 8–50 in each tubercle; perithecial wall thin, brownish-black; paraphyses rather sparse and long; spores often uniseriate in the ascus, obovate, colourless, then dark-brown or nearly black, 1-septate, one cell small and triangular, 0,016–25 mm. long, 0,008–12 mm. thick; hymenial gelatine yellowish-brown with iodine. Specimen not seen.

Hab. On turfy ground.—*Distr.* Ben Lawers, Perthshire.

100. **OBRYZUM** Wallr. Naturg. Flecht. p. 253 (1825) emend.; Nyl. in Flora lii. p. 353 (1872). (Pl. 36.)

Thallus none. Perithecia minute, globose, parasitic, immersed in the tissue of the host-plant or almost superficial,

opening above by a pore; spores 8 in the ascus, fusiform, simple or septate, colourless.

Described at first as homogeneous with the thallus on which it grows (Collemaceæ); its parasitic nature was determined by Nylander (*l. c.*).

1. **O. corniculatum** Wallr. *l. c.*; Nyl. in Flora lviii. p. 106 (1875).—Thallus none proper. Perithecia immersed or almost superficial on the laciniæ of the host thallus, globose; perithecial wall entire, thin, brownish; paraphyses none; asci small, somewhat elongate, swollen in the middle; spores shortly fusiform, simple, with several guttulæ and pointed at each end, 0,016–21 mm. long, 0,005–6 mm. thick; hymenial gelatine not tinged with iodine.—*Verrucaria corniculata* Leight. Lich. Fl. ed. 3, p. 497 (1879).

Hab. Parasitic on various species of *Leptogium*.—*Distr.* Rare in S.W. England.—*B. M.* Weston-super-Mare, Somerset; Cowcombe Wood, Chalford and near Cirencester, Gloucestershire.

2. **O. dolichoteron** Nyl. in Flora lii. p. 353 (1872).—Thallus none proper. Perithecia projecting like small golden balls from the tissue of the host, scattered, numerous, globose; perithecial wall entire, brownish; paraphyses none; spores narrow, fusiform, colourless, 3–5-septate, 0,023–27 mm. long, 0,004–5 mm. thick.—*Verrucaria dolichotera* Leight. Lich. Fl. ed. 3, p. 497 (1879).

Differing from the preceding in the lighter coloured perithecia, and in the character of the spores.

Hab. Parasitic on Collemaceæ.—*B. M.* Craig Tulloch, Blair Athole, Perthshire (on *Collema melænum*).

DERMATOCARPACEÆ.

Thallus spreading, foliaceous or squamulose or subcrustaceous, corticated on one or both surfaces or non-corticated, under surface naked or with rhizinæ. Perithecia simple, more or less immersed in the thallus, opening by a pore at the apex. Spermogones with short straight spermatia.

Three genera of the Order occur in the British Isles, well differentiated by the form of thallus or spores. *Endocarpon* is further distinguished by the presence of green algal cells (*gonidia*) in the hymenium as well as in the thallus; they are produced in loose filaments or masses alongside of the asci and paraphyses, and are ejected from the perithecium with the mature spores.

Gonidia not present in hymenium.
- Spores simple ..... 101. **Dermatocarpon.**
- Spores septate ..... 102. **Normandina.**
- Spores muriform ..... 103. **Dacampia.**

Gonidia present in hymenium.
- Spores muriform ..... 104. **Endocarpon.**

101. **DERMATOCARPON** Eschw. Syst. Lich. p. 21 (1824) emend.; Th. Fr. Lich. Arct. p. 252 (1860). (Pl. 37.)

Thallus leafy or squamulose, corticated on both surfaces or only on the upper surface, sometimes with rhizinæ. Algal cells *Pleurococcus*. Perithecia simple, immersed in the thallus, globose or ovate, with a projecting ostiole; paraphyses usually mucilaginous and cohering, or sparingly developed and branched; asci 8–16-spored; spores simple, colourless. Spermogones divided into hollow chambers, opening by a slit.

1. **D. miniatum** Th. Fr. Lich. Arct. p. 253 (1860).—Thallus spreading, ashy-grey or whitish, leafy, peltate, coriaceous, rather large, rounded or somewhat crenate-lobate, smooth or minutely granular-pruinose, attached by a central point to the substratum, the under surface tawny or brownish, smooth or wrinkled. Perithecia minute, numerous, immersed, with a prominent brown ostiole; spores 8 in the ascus, oblong or ellipsoid, 0,010–16 mm. long, 0,006–9 mm. thick.—*Lichenoides coriaceum nebulosum cinereum punctatum, subtus fulvum* Dill. Hist. Musc. p. 223, t. 30, f. 127B. (1741). *Lichen miniatus* L. Sp. Pl. p. 1149 (1758); Huds. Fl. Angl. p. 454; Lightf. Fl. Scot. ii. p. 857; With. Arr. ed. 3, iv. p. 66; Engl. Bot. t. 593, two upper figs. *Endocarpon miniatum* Ach. Meth. p. 127 (1803); S. F. Gray Nat. Arr. i. p. 501; Hook. Fl. Scot. ii. p. 44 & in Sm. Engl. Fl. v. p. 156 pro parte; Grev. Fl. Edin. p. 329; Tayl. in Mackay Fl. Hib. ii. p. 98 pro parte; Mudd Man. p. 265; Cromb. Lich. Brit. p. 107 pro parte; Leight. Lich. Fl. p. 409; ed. 3, p. 441. *E. miniatum* var. *umbilicatum* Hook. ex Leight. Angioc. Lich. p. 11, t. 1, f. 4 (1851).

Exsicc. Dicks. Hort. Sicc. n. 24; Bohl. n. 1; Leight. n. 26; Mudd n. 255; Larb. Lich. Cæsar. n. 94; Cromb. n. 100; Johns. n. 400.

Hab. On dry rocks in maritime or mountainous districts.—*Distr.* Somewhat common throughout the British Isles.—*B. M.* L'Etacq, Beaufort and Rozel Tower, Jersey; Petit-Bot Bay, Guernsey; Tintagel and Pentire, St. Minver, Cornwall; Torquay, Ilsham and near Cockington, Devon; Leigh Wood and Cheddar Cliffs, Somerset; St. Vincent's Rocks, Gloucestershire; Manorbeer Castle, Pembrokeshire; Harlech Castle, Merioneth; near Conway, Carnarvonshire; near Beaumaris, Anglesea; Puffin Island; Miller's Dale, Derbyshire; Trowgill, Clapham, Yorkshire; Rokeby, Durham; Egremont, Cumberland; Falls of Clyde, Lanarkshire; Craiglockhart, near Edinburgh; Bowling, Dumbartonshire; near Dunkeld, Kenmore and Glen Lochay, Perthshire; I. of Lismore, Argyll; Craig Guie, Braemar, Aberdeenshire; near Glencorbot and Kylemore, Connemara, Galway.

Var. **leptophyllum** Dalla Torre & Sarnth. Fl. Tirol. p. 503 (1902).—Thallus small, peltate, solitary or of several lobes, greyish or dark-brown, the under surface dark-coloured.—*Lichen leptophyllus* Ach. Lich. Suec. Prodr. p. 141 (1798); Engl. Bot. t. 2012, f. 2. *Endocarpon leptophyllum* Ach. Meth. p. 127 (1803);

S. F. Gray Nat. Arr. i. p. 501; Hook. Fl. Scot. ii. p. 44 & in Sm. Engl. Fl. v. p. 157; Tayl. in Mackay Fl. Hib. ii. p. 99; Leight. Angioc. Lich. p. 12, t. 2, f. 2. *E. miniatum* var. *leptophyllum* Wahlenb. Fl. Suec. p. 875 (1826); Mudd Man. p. 266; Cromb. Lich. Brit. p. 107; Leight. Lich. Fl. p. 410; ed. 3, p. 442.

Distinguished from the species by the small size of the thallus.

Hab. On moist rocks.—*Distr.* Rare in subalpine or hilly regions, in N. England, Wales, N. Scotland and S.W. Ireland.—*B. M.* Buxton, Derbyshire; Aberidu, Brecknockshire; Bala Lake and Llyn Bodlyn, Merioneth; Cumberland; Loch-na-gat, Ben Lawers, Perthshire; Loch Lomond, Dumbartonshire; Killarney Woods, Kerry.

Var. **complicatum** Th. Fr. *l. c.* Thallus ascending, composed of numerous densely cæspitose lobes, imbricate and complicate, with the under surface darker than in the species.—Dill. *l. c.* f. 127A. *Lichen miniatus* var. *complicatus* Lightf. Fl. Scot. ii. p. 858 (1777) pro parte. *L. complicatus* Swartz in Nov. Act. Upsal. iv. p. 251 (1784). *L. amphibius* With. Arr. ed. 3, iv. p. 66 (1796). *L. miniatus* Sm. Engl. Bot. t. 593 lower fig. (1799). *Endocarpon complicatum* Ach. Meth. p. 128 (1803); S. F. Gray Nat. Arr. i. p. 501; Hook. Fl. Scot. ii. p. 44; Grev. Fl. Edin. p. 329. *E. miniatum* var. *complicatum* Wahlenb. Fl. Suec. p. 875 (1826); Tayl. in Mackay Fl. Hib. ii. p. 98; Hook. in Sm. Engl. Fl. v. p. 156; Leight. Angioc. Lich. p. 11, t. 2, f. 1 & Lich. Fl. p. 410; ed. 3, p. 442; Mudd Man. p. 265; Cromb. Lich. Brit. p. 107.

Exsicc. Leight. n. 167; Mudd n. 256; Larb. Lich. Hb. n. 158.

Hab. On damp rocks, exposed to spray or occasionally inundated. —*Distr.* Somewhat frequent throughout the British Isles.—*B. M.* L'Etacq, Jersey; Petit-Bot Bay, Guernsey; St. Minver and near Penzance, Cornwall; Dartmoor Tors, Devon; near Cirencester, St. Vincent's Rocks and near Cheltenham, Gloucestershire; Barmouth, Merioneth; Puffin Island; Cleveland, Yorkshire; Falcon Clints, Teesdale, Durham; Craiglockhart near Edinburgh; Bowling, Dumbarton; Kinnoull Hill, Glen Lochay, Killin, Ben Lawers and Kenmore, Perthshire; I. of Lismore, Argyll; Fort William and Invermoriston, Invernessshire; Craig Guie, Braemar, Aberdeenshire; Connor Cliffs, Dingle, Killarney, Kerry; Glencorbot and Dawros River, Connemara, Galway.

Form **decipiens** A. L. Sm. Lobes of the thallus ascending, smaller than in var. *complicatum* and more compact, more or less involute and crowded in the centre, spreading at the periphery.—*Endocarpon miniatum* var. *decipiens* Massal. Ric. Lich. p. 184 (1852).

Hab. On moist rocks.—*Distr.* Rare in N. England and N. Scotland.—*B. M.* Teesdale, Yorkshire; south side of Loch Tay, Perthshire.

2. **D. aquaticum** A. Zahlbr. Krypt. Exsicc. n. 652 (1901).—Thallus spreading, polyphyllous, rather thick and coriaceous, the lobes crowded, flaccid, crenate and incurved, tumid, ascending in the centre, more flattened at the circumference, green when wet, pale to brownish when dry, the under side naked, pale at first then darker coloured. Perithecia minute, innate, sometimes confluent, with slightly prominent brown ostioles; spores 8 in the ascus, oblong or ellipsoid, 0,010–16 mm. long, 0,006–9 mm. thick.—*Lichenoides imbricatum luridum* Dill. Hist. Musc. p. 224, t. 30, f. 128 (1741). *Lichen aquaticus* Weiss Pl. Crypt. Fl. Goett. p. 77 (1770); Engl. Bot. t. 594. *L. fluviatilis* Web. Spicil. Fl. Goett. p. 265, t. 4 (1778); With. Arr. ed. 3, iv. p. 67. *L. Weberi* Ach. Lich. Suec. Prodr. p. 142 (1798). *Endocarpon Weberi* Ach. Meth. p. 128 (1803); S. F. Gray Nat. Arr. i. p. 501; Hook. Fl. Scot. ii. p. 45; Grev. Fl. Edin. p. 329. *E. fluviatile* DC. Fl. Fr. ii. p. 413 (1805); Mudd Man. p. 266; Cromb. Lich. Brit. p. 108; Leight. Lich. Fl. p. 410; ed. 3, p. 442. *E. miniatum* var. *aquaticum* Schær. Spicil. p. 60 (1826); Hook. in Sm. Engl. Fl. v. p. 156; Tayl. in Mackay Fl. Hib. ii. p. 98.

Exsicc. Larb. Lich. Hb. n. 358 & Lich. Cæsar. n. 95.

Approaches var. *complicatum* of the preceding species in the size and form of the thalline lobes, but is well distinguished by its thicker coriaceous character and by the habitat. The lobes, usually rather large and rounded, are occasionally only from 1 to 0·5 cm. in width and deeply cut and laciniate.

Hab. On rocks and stones in streams and lakes.—*Distr.* Rare, but widely distributed, chiefly in upland districts.—*B. M.* East coast of Jersey; Saints Bay, Guernsey; St. Breock, Cornwall; River Teign, near Keston, Lydford, the Dart River and Ivy Bridge, Devon; Tewy Llandyssiel, Cardiganshire; Harlech Castle and Barmouth, Merioneth; Ilam, Staffordshire; Windermere, Westmoreland; Eglestone and Teesdale, Durham; Kincardineshire; Loch Lomond, Dumbartonshire; Appin, Argyll; Loch Dochart, Loch Tummel and shores of Loch Tay, Killin, Perthshire; shores of Loch Linnhe, Invernessshire; Killarney, Kerry.

Var. **euplocum** A. L. Sm.—Thallus coriaceous, minute, monophyllous, affixed to the substratum by a central point, deeply lobed, the margins crisped and recurved, olive-green when moist, greyish or brownish when dry.—*Lichen euplocus* Ach. Lich. Suec. Prodr. p. 141 (1798). *Endocarpon euplocum* Ach. Meth. p. 127, t. 3, f. 4 (1803); Borr. in Engl. Bot. Suppl. t. 2602, f. 2; Hook. in Sm. Engl. Fl. v. p. 157; Leight. Angioc. Lich. p. 12, t. 2, f. 3. *E. fluviatile* var. *euplocum* Mudd Man. p. 266 (1861); Leight. Lich. Fl. p. 411; ed. 3, p. 443. *E. miniatum* var. *euplocum* Wahlenb. Fl. Suec. p. 875 (1826); Cromb. Lich. Brit. p. 107. *Verrucaria euploca* Borr. in Engl. Bot. Suppl. *l. c.* text (1831).

A minute variety of the species bearing the same relation to it as var. *leptophyllum* does to *D. miniatum*.

Hab. On maritime rocks.—*Distr.* Rare in N.E. England.—*B. M.* On the shore of the Tyne, near Newcastle, Northumberland.

3. **D. lachneum** A. L. Sm.—Thallus coriaceous, squamose, brownish-red, the squamules roundish, flexuose or incised, often imbricate with the margins free, or appressed and adnate, under surface rhizinose. Perithecia minute, the ostioles dark-brown; spores 8 in the ascus, oblong or ovate, 0,013–18 mm. long, 0,008 mm. thick.—*Lichen lachneus* Ach. Lich. Suec. Prodr. p. 140 (1798); Sm. Engl. Bot. t. 1698 (1807). *L. leptophyllus* Sm. Engl. Bot. t. 2012, f. 1 (1809). *Endocarpon lachneum* Ach. Meth. p. 127 (1803); S. F. Gray Nat. Arr. i. p. 500; Tayl. in Mackay Fl. Hib. ii. p. 99; Leight. Angioc. Lich. p. 14, t. 3, f. 2 pro parte. *E. rufescens* Ach. Lich. Univ. p. 304 (1810); Mudd Man. p. 267 pro parte; Cromb. Lich. Brit. p. 108; Leight. Lich. Fl. p. 411; ed. 3, p. 443 (incl. f. *lachneum*). *E. Hedwigii* var *lachneum* Hook. in Sm. Engl. Fl. v. p. 156 (1833).

Exsicc. Bohl. n. 75 (as *Endocarpon Hedwigii*).

The species name *lachneum* is older than *rufescens*, and Smith's figure of *Lichen lachneus* unquestionably represents this plant. Acharius originally described *E. rufescens* as reddish when fresh, and *E. lachneum* as at first greenish-brown. The British specimens vary in colour from brown to brownish-red.

Hab. On earth among rocks, chiefly in upland regions.—*Distr.* Rare in the maritime and hilly regions of the British Isles.—*B. M.* St. Minver, Cornwall; Torquay, Devon; Albourne and near Houghton, Sussex; Cheddar Cliffs, Clifton and Bathhampton Downs, Somerset; Llanymynech Hill, Shropshire; Malvern Hill, Worcestershire; Tenby, Pembrokeshire; Newmarket Heath, Cambridgeshire; near Buxton and Dovedale, Derbyshire; Malham, Yorkshire; Windermere, Westmoreland; King's Park, Edinburgh; Craig Calliach and Ben Lawers, Perthshire; Craig Guie, Braemar, Aberdeenshire; Hills of Applex, Rossshire.

4. **D. hepaticum** Th. Fr. Lich. Arct. p. 255 (1860).—Thallus coriaceous, squamulose, brownish to dark-brown, the squamules round or angular, closely adnate, more or less dispersed, the margins entire, sometimes rather raised and blackish, the under surface fibrillose. Perithecia minute, the ostioles dark-brown; spores 8 in the ascus, oblong, 0,011–16 mm. long, 0,006–8 mm. thick.—*Lichenoides, quod Lichen pulmonarius terrestres, etc.* Dill. Hist. Musc. p. 228, t. 30, f. 133 (1740)? *Lichen trapeziformis* Zoega ex Dicks. Pl. Crypt. ii. (1790)? Engl. Bot. t. 595? *Endocarpon hepaticum* Ach. Lich. Univ. p. 298 (1810); Cromb. Lich. Brit. p. 108 pro parte; Leight. Lich. Fl. p. 412; ed. 3, p. 443 (incl. f. *exiguum*). *E. Hedwigii* S. F. Gray Nat. Arr. i. p. 500 (1821) pro parte; Grev. Fl. Edin. p. 329 pro parte; Hook. in Sm. Engl. Fl. v. p. 156 (1833)? (non Ach.); Leight. Angioc. Lich. p. 14, t. 3, f. 3 (1851) pro parte. *E. pusillum* Tayl. in Mackay Fl. Hib. ii. p. 99 (1836) (non Hedw.); Mudd Man.

p. 268 (1861) pro parte. *E. exiguum* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 422 (1856).

Exsicc. Leight. n. 135 (as *Endocarpon Hedwigii*); Mudd n. 257 (as *E. pusillum*).

Closely allied to the preceding species, but the colour of the thallus is usually brown, the squamules smaller, more scattered, more closely adnate and often with a dark edge, the spores also are rather smaller. It has been confused with *Endocarpon pusillum*, which has a somewhat similar thalline development. It is impossible in the absence of specimens to identify accurately the plants included under *Lichen trapeziformis* by Dickson and Smith.

Hab. On the ground in barren places and on old walls.—*Distr.* Rare throughout the British Isles.—*B. M.* Noirmont, Jersey; near Penzance, Cornwall; Babbicombe and Totnes Downs, Devon; Newhaven Cliffs, near Lewes, and Box Grove near Chichester, Sussex; Reigate Hill, Surrey; Epping Forest, Essex; Fairford and Cirencester, Gloucestershire; Moor Park, Herefordshire; Tenby, Pembrokeshire; near Dolgelly, Merioneth; I. of Anglesea; Clapham, Yorkshire; Appin, Argyll; Ben Lawers and Glen Lochay, Killin, Perthshire; Lower Road, Cork; Dunkerron, Kerry.

5. **D. cinereum** Th. Fr. Lich. Arct. p. 256 (1860).—Thallus squamulose, closely adherent, greyish-brown, the squamules scattered or congregate, the under surface black. Perithecia numerous, minute, with a prominent dilated dark-brown ostiole; spores 8 in the ascus, elliptical-oblong, rather large, simple or sometimes pseudo-septate, colourless, 0,018–22 mm. long, 0,008–11 mm. thick.—*Endocarpon cinereum* Pers. in Ust. Ann. Bot. vii. p. 28 (1794); Mudd Man. p. 268. *E. tephroides* Ach. Meth. p. 129 (1803); S. F. Gray Nat. Arr. i. p. 499 (1821); Hook. Fl. Scot. p. 44 pro parte & in Sm. Engl. Fl. v. p. 159. *Lichen tephroides* Ach. Lich. Suec. Prodr. p. 18 (1798); Engl. Bot. t. 2013. *Sagedia cinerea* Fr. Lich. Eur. p. 413 (1831); Leight. Angioc. Lich. p. 22, t. 7, f. 1. *Verrucaria tephroides* Nyl. in Maine et Loire Mém. Soc. Acad. iv. p. 17 (1858); Cromb. Lich. Brit. p. 108; Leight. Lich. Fl. p. 428; ed. 3, p. 458.

Exsicc. Larb. Lich. Cæsar. n. 96 & Lich. Hb. n. 117.

The spores are for a long time simple and full of small granules, but at maturity they seem to be more or less faintly septate, and have been so figured by Leighton.

Hab. On the ground mostly in mountainous regions.—*Distr.* Rare in the Channel Islands, S. and N. England, N. Scotland and W. Ireland. —*B. M.* Grosnez Common, Jersey; Cader Idris, Merioneth; Teesdale, Durham; Finlarig, Killin and Ben Lawers, Perthshire; Ben Cruachan and I. of Lismore, Argyll; Hills of Applex, Rossshire; Craig Guie, Braemar, Aberdeenshire; Stronsay, Orkney; Cleghan, Connemara, Galway.

Var. **cartilagineum** A. L. Sm.—Squamules firmer, more cartilagineous than in the species, subimbricate and sublobate, pale-greyish or brownish.—*Verrucaria tephroides* var. *cartilaginea*

Nyl. in tom. cit. p. 18; Cromb. Lich. Brit. p. 109; Leight. Lich. Fl. p. 428; ed. 3, p. 459. *V. cartilaginea* Carroll in Journ. Bot. iv. p. 24 (1866).

Hab. On the earth.—*Distr.* Rare in Alpine localities.—*B. M.* Summit of Ben Lawers, and summit of Craig Calliach, Perthshire.

6. **D. macrocarpon** A. L. Sm.—Thallus of small squamules, scattered or aggregate, sublobate or subcrenate, appressed, pale-dusky-olive when dry, light-green when wet. Perithecia immersed in the squamules, the upper part free, opening by a pore; perithecial wall thick; spores 8 in the ascus, ellipsoid, colourless, very large, 0,040–45 mm. long, 0,015 mm. thick.—***Endocarpon macrocarpon*** Tayl. in Mackay Fl. Hib. ii. p. 258 (1836); Leight. Angioc. Lich. p. 15, t. 14, f. 2 (1851)? ***Verrucaria macrocarpa*** Mudd Man. p. 290 (1861).

Leighton's figure represents a globose fruit with a double wall, the inner enclosing the hymenium, and between it and the base "a dirty-white or tartareous mass." The spores according to the same figure are simple, brownish-coloured and ellipsoid, about 0,025 mm. long, 0,012 mm. thick. These characters do not correspond with those given above of the original specimen from Taylor in the British Museum. The plant in the single specimen seen is associated with *Pannularia nigra*.

Hab. On slaty rocks.—*Distr.* Very rare in S.W. Ireland.—*B. M.* Dunkerron, Kerry (the only locality).

102. **NORMANDINA** Nyl. in Mém. Soc. Sci. Nat. Cherb. iii. p. 191 (1855) emend.; Wainio Lich. Brésil ii. p. 188 (1890). (Pl. 38.)

Thallus foliaceous or squamulose, the squamules raised or appressed, without a cortical layer. Algal cells *Pleurococcus*. Perithecia immersed, globose or ovate with a blackish wall; paraphyses wanting; spores 8 in the ascus, elongate-cylindrical, septate, colourless, becoming brownish.

A monotypic genus very widely spread in Europe, America and New Zealand, though not common.

1. **N. pulchella** Cromb. Lich. Brit. p. 107 (1870).—Thallus glaucous or greenish-grey, squamulose, the squamules round or rounded-lobate, adnate, often concentrically wrinkled, the margins raised, thickened or inflexed and frequently sorediate, pale-brownish and tomentose beneath. Perithecia very rare, immersed in the thallus, the black ostiole protruding; spores linear-cylindrical, 6–7-septate, colourless, becoming brownish, 0,028–40 mm. long, 0,006–010 mm. thick; hymenial gelatine wine-red with iodine.—Leight. Lich. Fl. p. 408; ed. 3, p. 440. ***Verrucaria pulchella*** Borr. in Engl. Bot. Suppl. t. 2602, f. 1 (1829) (text). ***Endocarpon pulchellum*** Borr. in Engl. Bot. Suppl. t. 2602, f. 1 (1829) (plate); Hook. in Sm. Engl. Fl. v. p. 158; Tayl. in Mackay Fl. Hib. ii. p. 101; Leight. Angioc. Lich. p. 13, t. 3, f. 1. *Nor-*

mandina Jungermanniæ Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 419 (1856); Mudd Man. p. 268.

Exsicc. Leight. n. 367; Cromb. n. 197; Larb. Lich. Hb. 157 & Lich. Cæsar. n. 93.

Hab. On mossy trees.—*Distr.* Not common, but occurring in all parts of the British Isles.—*B. M.* St. Peter's Valley, Rozel, Jersey; Guernsey; near Launceston, and Withiel, near Bodmin, Cornwall; Plymouth, near Lidford, Ullacombe near Bovey Tracey, and near Ilfracombe, Devon; near Ryde, I. of Wight; New Forest, Hants; St. Leonard's Forest, Poynings Common, Saddlescomb, Arundel Park, Glynde, Ardingly, Wiston, Crowborough and Beeding Priory, Sussex; Dolgelly and Barmouth, Merioneth; Keswick, Cumberland; The Trossachs, Glen Lochay, Glen Falloch and Finlarig, Killin, Perthshire; Barcaldine, Argyll; Glen Nevis, Invernessshire; Derriquin, Killarney, Kerry; Letterfrack, Connemara, Galway.

103. **DACAMPIA** Massal. Sulla *Lecidea Hookeri* di Schærer, Verona, 1853, p. 7. (Pl. 39.)

Thallus squamulose, spreading, with a black subiculum. Algal cells *Pleurococcus*. Perithecia entire, carbonaceous; paraphyses persistent, branched; asci elongate; spores ellipsoid-fusiform, variously septate and muriform, brown.

A somewhat doubtful monotypic genus; the perithecia have been regarded by A. Zahlbruckner (Pflanzenf. i. 1*, p. 78 (1908)) and other lichenologists as a fungus parasitic on a lichen-thallus.

1. **D. Hookeri** Massal. *l. c.* t. 1, fig. 4.—Thallus squamulose, whitish, thick, somewhat lobate at the circumference, appressed and farinose, not corticated. Perithecia rising from the lower dark stratum, obpyriform with a somewhat wide ostiole; perithecial wall dark-brown, rather thick, entire; paraphyses stoutish, branched and entangled, conglutinate or free; asci elongate; spores 8 in the ascus, ellipsoid, fusiform, 3–5-septate, rarely only 2-celled, constricted in the middle, becoming muriform, dark-brown, the end cells small, lighter in colour, 0,020–35 mm. long, 0,010–12 mm. thick.—*Verrucaria Hookeri* Borr. in Engl. Bot. Suppl. t. 2622, fig. 2 (1830); Hook. in Sm. Engl. Fl. v. p. 155; Leight. Angioc. Lich. pp. 64, 77, t. 27, fig. 5. *Lecidea Hookeri* Schær. Enum. p. 102 (1850); Cromb. Lich. Brit. p. 88; Leight. Lich. Fl. p. 309; ed. 3, p. 322.

Exsicc. Leight. n. 318.

Considerable confusion of views has arisen as to the structure and systematic position of Borrer's plant, the perithecia having more recently been described as fungi parasitic on the thallus of *Lecidea Hookeri*, the latter having 2-celled brown spores. There is no record of *L. Hookeri* in Britain other than the specimens bearing the perithecia of *Dacampia*, and in that respect the continental specimens examined agree with the British. The 2-celled brown spores are occasionally present along with the more developed muriform ones. The thallus becomes dark-brown in the lower parts,

passing into brown fungal hyphæ (the hypothallus of the lichen), and from this lower stratum the perithecia are developed; they are true perithecia when first formed, but tend to widen out or collapse above to an almost lecideine form as described by Schærer. Further investigation and more accurate observations of fresh material are necessary to determine the existence of two plants and the fungal or symbiotic character of the perithecium.

Hab. On earth on alpine rocks.—*B. M.* Plentiful on the summit of Ben Lawers.

104. **ENDOCARPON** Hedw. Descr. Adumbr. Musc. frond. ii. p. 56 (1788); emend. Th. Fr. Lich. Arct. p. 257 (1860); A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, p. 61 (1903). (Pl. 40.)

Thallus squamulose, or almost crustaceous, corticated on both surfaces or only on the upper surface, sometimes rhizinose beneath. Algal cells *Pleurococcus*. Perithecia simple, immersed in the thallus, globose or ovate, with a more or less prominent ostiole and with hymenial gonidia; paraphyses mucilaginous, disappearing; asci 1–6-, usually 2-spored; spores elongate-ellipsoid, muriform, at first colourless becoming dark-brown.

First published as a genus by Hedwig with *E. pusillum* as the type; it was finally emended by A. Zahlbruckner to include only those forms that have a squamulose thallus with hymenial gonidia and muriform spores.

1. **E. pusillum** Hedw. *l. c.* t. 20A, figs. 1–8.—Thallus squamulose, greyish- or reddish-brown, the squamules scattered or crowded, small, closely adnate to the substratum, the margins slightly raised and crenate. Perithecia minute, black, with a prominent black ostiole; hymenial gonidia small, in lines parallel with the asci or in masses; spores 2 in the ascus, oblong, becoming brown, slightly constricted in the middle, muriform, and multi-cellular, 0,045–55 mm. long, 0,014–19 mm. thick.—*Lichen trapeziformis* Zoega ex Dicks. Pl. Crypt. ii. p. 22 (1790)? *L. endocarpon* With. Arr. ed. 3, iv. p. 52 (1796)? *Verrucaria Garovaglii* Mont. in Ann. Sci. Nat. sér. 3, xi. p. 59 (1849); Cromb. Lich. Brit. p. 109 pro parte; Leight. Lich. Fl. p. 459; ed. 3, p. 491 pro parte. *Dermatocarpon Garovaglii* Mudd Man. p. 270, t. 5, f. 111 (1861).

Hab. On earth-covered rocks.—*Distr.* Rare in S. England.—*B. M.* Thetford, Devon; Alum Bay, I. of Wight; cliffs, Rottingdean, Sussex.

2. **E. sorediatum** Hook. in Sm. Engl. Fl. v. p. 158 (1833); A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, p. 61 (1903).—Thallus squamulose, olive-green, brown when dry, the squamules mostly scattered, appressed, irregularly lobed, the margins slightly elevated and crenate, under surface pale-grey. Perithecia minute, black, the ostiole powdery, blackish-grey; spores as in

the preceding species.—Leight. Angioc. Lich. p. 18. *Verrucaria sorediata* Borr. in Engl. Bot. Suppl. t. 2612, f. 2 (1829).

Often included in the preceding species from which it differs only in the larger size and lighter colour of the thallus, and in the sorediate apex of the perithecia.

Hab. On mud walls.—*Distr.* Very rare, recorded only from Thetford, Norfolk.—*B. M.* One small specimen without locality.

3. **E. pallidum** Ach. Lich. Univ. p. 301 (1810).—Thallus pale-reddish-brown, squamulose, the squamules minute, crowded, imbricate, lobate and crenate. Perithecia minute, dark-brown, the ostioles prominent, brownish-black; spores 2 in the ascus, brownish, linear-oblong, muriform becoming brown, large, 0,034–54 mm. long, 0,014–19 mm. thick, sometimes slightly constricted.—S. F. Gray Nat. Arr. i. p. 500; Hook. in Sm. Engl. Fl. v. p. 157; Tayl. in Mackay Fl. Hib. ii. p. 99; Leight. Angioc. Lich. p. 19, t. 5, f. 3. *Lichen pallidus* Sm. Engl. Bot. t. 2541 (1813). *Verrucaria pallida* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 424 (1856); Cromb. Lich. Brit. p. 109; Leight. Lich. Fl. p. 459; ed. 3, p. 491. *Dermatocarpon pallidum* Mudd Man. p. 269 (1861).

Well distinguished by the small imbricate crowded squamules.

Hab. On earth-covered rocks.—*Distr.* Rare in S.W. Ireland.—*B.M.* Killarney, Kerry.

4. **E. rugosum** Tayl. in Mackay Fl. Hib. ii. p. 258 (1836).—Thallus subtartareous, with tumid waved aggregate pruinose warts, glaucous grey, not altered when wet; buds in a coarse whitish powder on the summits of the warts. Apothecia minute, few, scattered, oblong, quite immersed, with dark-brown, depressed summits.—Leight. Angioc. Lich. p. 15, t. 4, fig. 1.

Leighton was unable to find asci or spores in the fruits of this lichen, and points out that the habit and appearance seem to resemble *Pertusaria* far more than *Endocarpon*. There are two specimens in the British Museum, one of them from Taylor's Herbarium, both of them with sterile thallus only, probably of some *Pertusaria*.

VERRUCARIACEÆ.

Thallus crustaceous, superficial or developed within the substratum, not corticated. Algal cells (*gonidia*) *Pleurococcus* or *Palmella*, sometimes present in the hymenium. Perithecia simple, globose or semi-globose, more or less immersed, opening by a pore at the apex (*ostiole*); asci 2–8-spored; paraphyses persistent or disappearing in mucilage. Spermogones globose, immersed, with jointed sterigmata and oblong or ellipsoid spermatia.

The order is distinguished by the crustaceous thallus, bright-green gonidia and simple fruits. There are seven British genera :—

Gonidia not present in hymenium.
Paraphyses disappearing.
Spores simple ..... 105. **Verrucaria.**
Spores 1–3-septate..... 106. **Thelidium.**
Spores muriform ..... 107. **Polyblastia.**
Paraphyses persistent.
Spores simple..... 108. **Thrombium.**
Spores multi-septate ..... 109. **Gongylia.**
Spores muriform ..... 110. **Microglæna.**
Gonidia present in hymenium.
Spores muriform ..... 111. **Staurothele.**

105. **VERRUCARIA** Pers. in Ust. Ann. Bot. vii. p. 23 (1794) pro parte (non Web. nec Humb.), emend. Th. Fr. Lich. Arct. p. 267 (1860).—*Lithocia* S. F. Gray Nat. Arr. i. p. 497 (1821) pro parte. (Pl. 41.)

Thallus crustaceous, continuous, areolate or pulverulent, sometimes developed within the substratum. Algal cells *Pleurococcus* or *Palmella*. Perithecia immersed in the thallus or superficial, the outer wall of a carbonaceous or horny structure completely surrounding the perithecium (*entire*) or developed only over the upper part (*dimidiate*), opening above by a pore or slit (*ostiole*); paraphyses soon becoming mucilaginous and disappearing; filaments within the ostiole (*periphyses*) well developed; asci 8-spored; spores ellipsoid or subglobose, colourless, rarely brown.

The *Verrucaria* of early authors was based on characters that belong to widely different Lichens. Persoon first defined the genus as possessing subglobose fruits; Th. Fries restricted it to those species with simple usually colourless spores and with paraphyses more or less dissolved in mucilage. In some species the dark outer perithecial wall is strongly developed only over the upper half of the fruits and spreads out at the base, a colourless or brownish layer of cells called the inner wall or tunic being continued under the base; this character is considered by some lichenologists to have generic value—*Lithocia* S. F. Gray, *Lithoicea* Massal. Mem. Lich. p. 141 (1853).

Maritime species growing within reach of waves or spray from the sea; thallus more or less gelatinous when moist.

1. **V. maura** Wahlenb. in Ach. Meth. Suppl. p. 19 (1803).—Thallus black or dark-reddish or brownish-black, thickish, or thin, smooth or subgelatinous, shining or occasionally somewhat scabrid, cracked into minute areolæ. Perithecia moderate in size, hemispherical, scattered, immersed in the thallus, the ostiole more or less visible; perithecial wall dimidiate and spreading at the base, a thin black layer being continued under the base; spores ellipsoid, 0,012–17 mm. long, 0,007–8 mm. thick, sometimes rather larger; hymenial gelatine wine-red with iodine.—Hook. Fl. Scot. ii. p. 43 & in Sm. Engl. Fl. v. p. 154; Grev. Fl.

Edin. p. 353 ; Tayl. in Mackay Fl. Hib. ii. p. 93 ; Leight. Angioc. Lich. p. 59, t. 25, f. 3 & Lich. Fl. p. 419 ; ed. 3, p. 449 ; Mudd Man. p. 284 ; Cromb. Lich. Brit. p. 113. *V. aractina* Wahlenb. tom. cit. p. 17 ; Cromb. *l. c.* (fide Leighton Lich. Fl. p. 419). *V. aspera* Tayl. in Hook. Lond. Journ. Bot. vi. p. 153 (1847)? *Lichen maurus* Sm. Engl. Bot. t. 2456 (1812). *Lithocia maura* S. F. Gray Nat. Arr. i. p. 498 (1821).

Exsicc. Leight. n. 33 pro parte.

Easily distinguished by the maritime habitat and by the well-developed polished-looking cracked thallus; the minute areolæ are slightly raised at the margin.

Hab. On maritime rocks.—*Distr.* Somewhat common on the coast of the British Isles.—*B. M.* Sark ; Gerrans, Cornwall ; Torquay, Devon ; Shoreham, Sussex ; Manorbeer near Tenby, Pembrokeshire ; Harlech Castle, Merioneth ; Pwllheli, Deganwy and Conway Bay, Carnarvonshire ; near Dunbar, Haddingtonshire ; Fifeshire ; Wills' Braes, Forfarshire ; Portlethen, Kincardineshire ; Dunkerron and Kenmare River, Kerry.

Var. **memnonia** Koerb. Syst. Lich. Germ. p. 340 (1855) e descript. ; Wedd. in Mém. Soc. Sci. Nat. Cherb. xix. p. 301 (1875). —Thallus thin, effuse, gelatinous, brownish-black with a light-coloured hypothallus, cracked in places when dry, but not areolate. Perithecia scarce, immersed in a swelling of the thallus ; spores varying in size, ellipsoid, 0,012–20 mm. long, 0,005–7 mm. thick, or 0,010–15 mm. long, 0,007–9 mm. thick, sometimes almost round.—*V. memnonia* Flot. ex Koerb. *l. c.*

Regarded as a variety by authors, but almost specifically distinct owing to the continuous thallus, the superficial cracks being due entirely to shrinking and occurring only on portions of the thallus. It is traversed in places by the greyish lines of the hypothallus.

Hab. On maritime rocks and growing nearer the sea than the species.—*B. M.* Jerbourg, Guernsey.

2. **V. mucosa** Wahlenb. in Ach. Meth. Suppl. p. 23 (1803).—Thallus olivaceous or dark-greenish, smooth, gelatinous, opaque, continuous, thin or sometimes rather thick. Perithecia minute, immersed and scarcely visible above the thallus ; perithecial wall dimidiate or almost entire ; spores small, ellipsoid, colourless, 0,007–10 mm. long, 0,005–6 mm. thick or rather larger.—Carroll in Journ. Bot. iii. p. 292 (1865) ; Cromb. Lich. Brit. p. 113 ; Leight. Lich. Fl. p. 413 ; ed. 3, p. 444. *V. microsporoides* Nyl. in Bull. Soc. Bot. France viii. p. 759 (1861) ; Carroll in tom. cit. p. 293 ; Cromb. Lich. Brit. p. 114 ; Leight. Lich. Fl. p. 414 ; ed. 3, p. 445.

Exsicc. Larb. Lich. Hb. n. 278.

In the British specimens the spores are slightly narrower than the size given by Th. Fries in Lich. Arct. p. 269, measuring generally about 0,004 mm. in thickness. Weddell (Mém. Soc. Sci. Nat. Cherb.

xix. p. 305 (1875)) calls attention to the very considerable variation in form and size of the spores of maritime lichens.

Hab. On maritime rocks, rarely on pebbles in streams.—*Distr.* Rare in the Channel Islands, S. Wales, E. and W. Scotland, and N., S. and W. Ireland.—*B. M.* St. Aubin's Bay and St. Ouen's Bay, Jersey; Coast of Alderney; Manorbeer Bay near Tenby, Pembrokeshire; Ardrishaig, Argyll; Caher Mountain, Kerry; Kilkee, Clare; Killery Bay, Connemara, Galway; Barclay's Rock, Down.

3. **V. microspora** Nyl. in Ann. Sci. Nat. sér. 4, iii. p. 175 (1855) (incl. f. *halophila*).—Thallus olivaceous or blackish-green, thin, continuous, gelatinous, smooth, effuse or determinate. Perithecia moderate in size, numerous, crowded, semi-immersed, black and shining, opening by a pore or somewhat depressed at the apex; perithecial wall dimidiate; spores minute, ellipsoid 0,007–0,010 mm. long, 0,004–5 mm. thick; hymenial gelatine faintly wine-red with iodine.—Carroll in Journ. Bot. iii. p. 292 (1865); Cromb. Lich. Brit. p. 113. *V. halophila* Nyl. ex Leight. Lich. Fl. p. 413; ed. 3, p. 445 (excl. syns. *V. aquatilis* and *V. leptotera*). *V. Whichcotii* Larb. ex Leight. *ll. c. V. littoralis* Tayl. in Hook. Lond. Journ. Bot. vi. p. 154 (1847)?

Exsicc. Larb. Lich. Hb. n. 195 & Lich. Cæsar. n. 100; Mudd n. 970; Leight. n. 33 pro parte (as *V. maura*).

Differs from *V. mucosa*, to which it is closely allied, in the thinner thallus, and the more prominent perithecia. A specimen from Jersey labelled *V. littoralis* Tayl. is intermixed and almost obscured by the red encrusting alga, *Hildenbrandtia rosea*. Müller-Argau (Flora lxxi. p. 550 (1888)) may have had a similar specimen, or part of a specimen in view when he referred the whole of Taylor's *V. littoralis* to the alga.

Hab. On maritime rocks or stones washed by the sea.—*Distr.* Rare on the sea coasts of the British Isles.—*B. M.* Grève-au-Lançon and St. Aubin's Bay, Jersey; Baggy Point, Mudstone and Brixham, Devon; Luccombe Chine, I. of Wight; Tenby, Pembrokeshire; Conway Bay, Carnarvonshire; Black Hall Rocks, Hartlepool, Durham.

4. **V. striatula** Wahlenb. in Ach. Meth. Suppl. p. 21 (1803). —Thallus shining black or greenish-black, gelatinous, consisting of numerous small elevated scattered ridges or lines irregularly or dendritically arranged. Perithecia minute, shining black, sessile, with a large depression at the apex; perithecial wall dimidiate; spores 8 in the ascus, colourless, ellipsoid, small, 0,008–9 mm. long, 0,004–5 mm. thick; hymenial gelatine wine-red with iodine.—Hook. in Sm. Engl. Fl. v. p. 155 (excl. syn.); Carroll in Journ. Bot. iii. p. 292 (1865); Cromb. Lich. Brit. p. 113; Leight. Lich. Fl. p. 414; ed. 3, p. 445. *Lithocia striatula* S. F. Gray Nat. Arr. i. p. 498 (1821) (excl. var.).

The thalline ridges are scattered or in somewhat crowded groups. They are formed from tips of the fungal hyphæ, which are blackish-

green and arranged in short closely serried ranks. The perithecia are scattered among the ridges, and are usually sessile on the substratum.

Hab. On maritime rocks.—*Distr.* Rare in the Channel Islands and S. England.—*B. M.* Coast of Alderney; St. Aubin's Fort, Grève-au-Lançon and Plémont, Jersey; Jerbourg, Guernsey.

5. **V. scotina** Wedd. in Mém. Soc. Sci. Nat. Cherb. p. 298 (1875) e descript.—Thallus brownish-black or umber-brown, rather thin, effuse, scabrid or occasionally cracked-areolate, sometimes almost entirely evanescent. Perithecia black, prominent, conical or hemispherical, rather large; perithecial wall entire or subentire; spores ellipsoid, sometimes almost round, obtuse at the ends, 0,010–17 mm. long, 0,005–9 mm. thick, colourless.

Exsicc. Larb. Lich. Cæsar. n. 98 (as *V. margacea*).

Agrees with other maritime species in the very dark-coloured thallus but grows above tide-level and is less distinctly mucilaginous. Weddell noted (*l. c.*) an odour of violets due without doubt to some alga with which it is associated.

Hab. On rocks by the seashore.—*Distr.* Only recorded from the Channel Islands.—*B. M.* Noirmont, Plémont and near Ile Percée, Jersey.

Aquatic species growing in or near streams, etc.; thallus subgelatinous, continuous or becoming cracked-areolate.

6. **V. aquatilis** Mudd Man. p. 285, t. 5, fig. 121 (1861).—Thallus thin, continuous or in spots, mucilaginous, dull olive-black. Perithecia minute, numerous, semi-immersed or often covered by the thallus, slightly depressed at the apex, opening by a pore; perithecial wall black, dimidiate; asci small, saccate, 8-spored; spores small, broadly elliptical or subglobose, colourless, 0,006–8 mm. long, 0,005–7 mm. thick.—*V. margacea* var. *aquatilis* Cromb. Lich. Brit. p. 112.

Exsicc. Mudd n. 971.

Hab. On rocks and stones in the beds of upland streams and rivulets.—*Distr.* Rare in W. and N. England.—*B. M.* Church Stretton, Shropshire; Malvern Hills, Worcestershire; Ayton, Cleveland, Yorkshire.

7. **V. imbrida** Tayl. in Hook. Lond. Journ. Bot. vi. p. 153 (1847).—Thallus effuse, thin, tartareous, equal, cracked, brownish-black, olivaceous when moist. Perithecia minute, immersed, scarcely visible, with a wide margined ostiole. Specimen not seen.

From the description, possibly allied to *V. aquatilis* or *V. hydrela*. Considered by Müller-Argau (Flora lxxi. p. 550 (1888)) to be referable to the genus *Pyrenopsis* and quoted by Crombie under *P. subareolata* (Part I. p. 24).

Hab. On smooth rocks near the spray of waterfalls; Kerry.

8. **V. rhodosticta** Tayl. *l. c.*—Thallus subtartareous, thin, verrucose, the verrucæ aggregate, purplish-black when dry, subgelatinous and reddish when moist, minutely wrinkled; perithecia scattered, subglobose, scabrid. Specimen not seen.

Considered by Taylor as allied to the previous species, also referred by Müller-Argau (tom. cit. p. 551) to *Pyrenopsis*. The descriptions of both species are too incomplete for accurate identification.

Hab. On wet rocks near Sheen Bridge, Kerry.

9. **V. hydrela** Ach. Syn. p. 94 (1814); Garovaglio Tent. Disp. Meth. Lich. p. 22, t. 1, f. 2 (1864).—Thallus olivaceous or olive-brown, effuse or determinate, smooth, thin or often thickish, gelatinous, becoming subtartareous, continuous, then somewhat cracked, smooth, sometimes unequal. Perithecia moderate in size, semi-immersed, the apex alone free, subglobose, black; perithecial wall dimidiate or continued below the base in a thin layer; spores ellipsoid, rather large, 0,019–26 mm. long, 0,008–18 mm. thick.—Mudd Man. p. 285; Shackleton & Hebden in Naturalist 1892, p. 17. *V. lævata* Leight. Angioc. Lich. p. 44, t. 19, f. 1 (1851) pro parte? *V. elæomelæna* Massal. in Atti. Istit. Ven. 1857, p. 380, t. 5, figs. 1–4. *V. margacea* var. *hydrela* Nyl. in Maine et Loire, Mém. Soc. Acad. iv. p. 26 (1858); Cromb. Lich. Brit. p. 112. *Lithoicea elæomelæna* Massal. *l. c.*

Exsicc. Cromb. n. 198 (as *V. elæomelæna*).

Distinguished from allied species by the continuous unequal thallus; the spores measure 0,012 mm. thick in the specimens examined.

Hab. On rocks which are often under water.—*Distr.* Rare in Central and W. England, and the Grampians, Scotland.—*B. M.* On rocks in streams, Chedworth, Gloucestershire; Malvern, Worcestershire; bed of the Wye, Buxton, Derbyshire.

10. **V. lævata** Ach. Lich. Univ. p. 284 (1810).—Thallus pale-greyish-brown, rather thick, tartareous, continuous or cracked-areolate, whitish towards the edges and determinate with a dark-coloured hypothallus. Perithecia immersed, the black shining ostiole emerging; perithecial wall entire, thickish; spores 8 in the ascus, ellipsoid, large, 0,018–24 mm. long or longer, 0,010–11 mm. thick; hymenial gelatine wine-red with iodine.—Borr. in Sm. Engl. Bot. Suppl. n. 2623, f. 2; Hook. in Sm. Engl. Fl. v. p. 153; Tayl. in Mackay Fl. Hib. ii. p. 91; Leight. Angioc. Lich. p. 44, t. 19, f. 1 pro parte & Lich. Fl. p. 418; ed. 3, p. 449; Mudd Man. p. 286.

Exsicc. Leight. n. 198; Mudd n. 273.

Closely allied to the preceding but distinguished by the more tartareous deeply-cracked areolate thallus and the covered perithecia.

Hab. On rocks and stones usually in streams.—*Distr.* In upland districts, rare in N. England, the Grampians, Scotland, and S. and W. Ireland.—*B. M.* Craigforda and brook between Tugford and Abdon, Shropshire; River Ithon, Llandrindod, Radnorshire; Carnedd

Dafydd, Carnarvonshire; Airyholme Wood, Cleveland, Yorkshire; Ben Lawers, Perthshire; Cork; Blackwater Bridge, Killarney, Kerry.

Var. **nigrata** Leight. Lich. Fl. ed. 3, p. 449 (1879).—Thallus blackish-brown. Perithecia larger than in the species, immersed.

Hab. On stones in running water.—*B. M.* Chedworth, Gloucestershire (the only locality).

11. **V. degenerascens** Nyl. Ms. in Larb. Lich. Hb. n. 200.—Thallus dark-brown, moderately thick, subdeterminate, mucilaginous when moist, continuous, then irregularly cracked, not distinctly areolate. Perithecia minute, semi-immersed, slightly depressed round the prominent ostiole; perithecial wall black, entire, thick above, continued beneath the base by a thinner layer; spores somewhat oblong, narrower at one end, 0,017–rarely –20 mm. long, 0,005–7 mm. thick.

Exsicc. Larb. Lich. Hb. n. 200.

Differing from *V. lævata* in the smooth superficially cracked thallus and in the smaller spores.

Hab. On rocks.—*B. M.* Lough Feagh, Connemara, Galway (the only locality).

12. **V. margacea** Wahlenb. Fl. Lapp. p. 465 (1812).—Thallus olive- or greyish-brown, thin, smooth, somewhat shining, continuous, effuse or determinate. Perithecia moderate in size, immersed in the thallus, becoming emergent, opening by a pore, the perithecial wall dimidiate, or thinly developed under the base; spores ellipsoid or oblong, rather large, 0,024–35 mm. long, 0,010–16 mm. thick; hymenial gelatine wine-red with iodine.—Cromb. Lich. Brit. p. 111 (excl. vars.); Leight. Lich. Fl. p. 416; ed. 3, p. 446 (excl. vars.). *V. submersa* Borr. in Sm. Engl. Bot. Suppl. t. 2768 (1833). *V. Leightonii* Hepp Flecht. Eur. n. 95 (1853); Mudd Man. p. 287 pro parte. *Thelotrema margacea* Wahlenb. ex Ach. Meth. Supp. p. 30 (1803).

On moist rocks often about the margins of streams.—*Distr.* Rather rare throughout the British Isles.—*B. M.* Trefriw Falls, Bettws-y-Coed, Carnarvonshire; Craig Tulloch, Blair Athole and Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire; near Ballinhassig, Cork; Caher Mts., Kerry.

13. **V. latebrosa** Kœrb. Syst. Lich. Germ. p. 349 (1855).—Thallus reddish-grey, effuse, thin, faintly areolate. Perithecia moderate in size, somewhat shining black, sessile more or less covered at the base by the thallus; perithecial wall dimidiate; spores usually 8 in the ascus, large, ellipsoid, becoming slightly brownish, 0,030–35 mm. long, 0,012–15 mm. thick.—Leight. Lich. Fl. ed. 3, p. 448.

Exsicc. Larb. Lich. Hb. n. 237.

Nearly allied to the preceding but with a less gelatinous thallus and more emergent perithecia.

Hab. On rocks.—*Distr.* Rare in W. Ireland.—*B. M.* Kylemore, Connemara, Galway.

14. **V. æthiobola** Wahlenb. ex Ach. Meth. Suppl. p. 17 (1803).—Thallus dark-olivaceous, effuse, thin, gelatinous when moist, sometimes slightly cracked. Perithecia moderate in size, numerous, black, at first covered by the thallus, then emergent; perithecial wall entire or thinly developed at the base; spores ellipsoid, 0,014–24 mm. long, 0,006–010 mm. thick; hymenial gelatine wine-red with iodine.—*V. margacea* var. *æthiobola* Nyl. Lich. Scand. p. 272 (1861); Cromb. Lich. Brit. p. 111; Leight. Lich. Fl. p. 416; ed. 3, p. 447. *V. devergescens* Nyl. in Flora lx. p. 462 (1877)? Cromb. in Grevillea vi. p. 114; Leight. Lich. Fl. ed. 3. p. 448.

Exsicc. Leight. n. 32 (as *V. irrigua* Tayl. var. *erysiboda* Leight.).

V. devergescens has been included as the specimen in the British Museum bearing the same date and from the same locality, as the type is identical with *V. æthiobola*. Nylander gives a larger size for the spores, 0,019–29 mm. long.

Hab. On wet rocks.—*Distr.* Rather rare in S.W. and N. England and in S. and W. Ireland.—*B. M.* Withiel, Cornwall; Dartmouth, Devon; Fishguard, Pembrokeshire; Dolgelly, Merioneth; Ffridd-du, near Aber, Carnarvonshire; Ayton, Bilsdale and Sowerdale, Cleveland, Yorkshire; near Ballinhassig and near Cork; Caher Mt., Dunkerron and Blackwater Bridge, Kerry; Doughruagh Mt. and Letterfrack, Connemara, Galway.

Var. **acrotella** A. L. Sm.—Thallus evanescent. Perithecia hemispherical, crowded or scattered, the perithecial wall spreading at the base; spores as in the species?—*V. acrotella* Ach. Meth. p. 123 (1803)? Tayl. in Mackay Fl. Hib. ii. p. 94; Cromb. Lich. Brit. p. 115 (excl. syn.). *V. margacea* var. *acrotella* Leight. Lich. Fl. p. 417 (1871); ed. 3, p. 448 (excl. syn.). *Lichen acrotellus* Sm. Engl. Bot. t. 1712 (1807). *Lithocia striatula* var. *acrotella* S. F. Gray Nat. Arr. i. p. 498 (1821).

Considered by Continental botanists to represent a form allied to *V. æthiobola* but always imperfectly developed. The Sowerby specimen has no spores, but one from Ireland, determined by Nylander as *V. acrotella*, though without thallus, has minute scattered apothecia and spores 0,021 mm. long, 0,007 mm. thick.

Hab. On stones.—*Distr.* Rare in S. England and in S.W. and N. Ireland.—*B. M.* Withiel, Cornwall; Aldington Beach, Kent; Ireland.

15. **V. submersa** Schær. Spicil. p. 334 (1836) (non Borr.).—Thallus determinate, thin, smooth, greenish when moist, becoming darker when dry, here and there slightly cracked. Perithecia small, immersed, then semi-emergent, sometimes surrounded at the base by a slight elevation of the thallus; perithecial wall dimidiate or continuous under the base in a thin layer; spores ellipsoid, 0,015–24 mm. long, 0,006–010 mm. thick.—Mudd Man.

p. 286. *V. chlorotica* Hepp Flecht. Eur. n. 94 (1853) (non Ach.); Mudd Man. p. 285. *V. margacea* var. *submersa* Cromb. Lich. Brit. p. 112 (1870).

Exsicc. Leight. n. 34; Mudd n. 272.

Differs from *V. æthiobola* in the lighter-coloured and usually better developed, more continuous thallus, forming a transition between it and *V. papillosa*. In some specimens the spores are persistently small, usually they measure about the same size as those of *V. papillosa*.

Hab. On rocks and stones in moist situations.—*Distr.* Rare in N. and W. England, N.W. Scotland, and in S. and W. Ireland.—*B. M.* Wotton-under-Edge, Gloucestershire; Tintern Abbey, Monmouthshire; Great Orme's Head, Carnarvonshire; near Ayton and Kildale, Cleveland, Yorkshire; I. of Lismore, Argyll; Ballinhassig, Glanmire Road, Cork; Blackwater Bridge, Kerry.

16. **V. papillosa** Ach. Lich. Univ. p. 286 (1810).—Thallus greyish, cracked into small irregular areolæ, effuse or determinate. Perithecia immersed then semi-emergent from a slight elevation of the thallus; perithecial wall dimidiate or continuous under the base in a thin layer; spores ellipsoid, 0,018–24 mm. long, 0,006–010 mm. thick.—Leight. Angioc. Lich. p. 54, t. 24, fig. 1; Mudd Man. p. 287. *V. margacea* var. *papillosa* Nyl. Lich. Scand. p. 272 (1861); Cromb. Lich. Brit. p. 112; Leight. Lich. Fl. p. 417; ed. 3, p. 447.

Exsicc. Mudd n. 274 (thallus poorly developed). Larb. Lich. Hb. n. 159 (as *V. æthiobola*).

Closely allied to the preceding, from which it differs only in the usually rather thicker more areolate thallus and the more papillose appearance of the perithecia which emerge from slight swellings of the thallus.

Hab. On rocks and stones in moist situations.—*Distr.* Rather rare in the Channel Islands, S.W. and N. England and W. Ireland.—*B. M.* St. Lawrence Hill, Jersey; Harberton and near Totnes, Devon; Shanklin, I. of Wight; Worcester; near Tenby, Pembrokeshire; Sowerdale, Cleveland, Yorkshire; Killarney, Kerry; Killery Bay and near Lettermore, Connemara, Galway; Westport, Mayo.

Thallus crustaceous or cartilaginous, cracked-areolate, effuse.

17. **V. viridula** Ach. Lich. Univ. p. 675 (1810).—Thallus effuse, tartareous or crustaceous, thickish, pale or greenish-olive-brown, cracked-areolate, the areolæ irregular smooth or wrinkled or verrucose. Perithecia black, large, deeply immersed, the upper part visible; perithecial wall black, thick over the upper half continued by a thin black layer under the base; spores broadly ellipsoid, large, 0,018–35 mm. long, 0,010–17 mm. thick.—Borr. in Sm. Engl. Bot. Suppl. after t. 2623, fig. 2 (text); Hook. in Sm. Engl. Fl. v. p. 153; Tayl. in Mackay Fl. Hib. ii. p. 91? Mudd Man. p. 289; Cromb. Lich. Brit. p. 111 (excl. var.

glaucina, incl. subsp. *subfuscella*); Leight. Lich. Fl. p. 424; ed. 3, p. 455. *V. nigrescens* subsp. *subfuscella* Nyl. Lich. Scand. p. 271 (1861). *V. mortarii* Leight. Lich. Fl. ed. 3, p. 546 (non Arn.). *Endocarpon viridulum* Schrad. Spicil. Fl. Germ. p. 192 (1794). *Lichen tessellatus* Sm. Engl. Bot. t. 533 (1798)? *Pyrenula tessellata* S. F. Gray Nat. Arr. 1, p. 493 (1821)? *Sagedia viridula* Fr. Lich. Eur. p. 414 (1831); Leight. Angioc. Lich. p. 23, t. 7, fig. 3.

Exsicc. Leight. nos. 98, pro parte (as *Endocarpon lithinum*), 140 (as *V. rupestris*), 229; Mudd n. 279; Larb. Lich. Hb. without a number (as *V. mortarii*).

Somewhat variable in the development of the thallus which is usually rather thick and deeply cracked, though it may become almost evanescent; it varies in colour from light greyish-green to a dirty-brownish colour (subsp. *subfuscella*). There is considerable similarity between it and *V. papillosa*, but the thallus of the latter species is thinner, and perithecia and spores smaller.

I have not seen Arnold's specimen of *V. mortarii;* the one recorded from Quy Churchyard, Cambridgeshire, is a growth form of *V. viridula*.

Hab. On mortar, old walls, rocks, &c.—*Distr.* Common in the Channel Islands and throughout England, rarer in Scotland and Ireland.—*B. M.* Alderney; St. Minver and Withiel, Cornwall; Plymouth and Torquay, Devonshire; Bembridge and Shanklin, I. of Wight; Midhurst Bridge and Petworth, Sussex; Hythe, Kent; Reigate, Surrey; Hempstead, Gloucestershire; Beveré and near Pershore, Worcestershire; Walthamstow, Essex; Whitecliff Rocks, near Ludlow, Shropshire; Shelton, Beds; Ulting, Essex; Much Wenlock, Shropshire; Gracedieu and Breedon-on-the-Hill, Leicestershire? (sterile thallus on an old leather sole); Quy, Cambridge; Bilsdale, near Guisboro' and Ayton, Cleveland, Yorkshire; Castle Eden Dean, Durham; near Cork; Derryquin, Kerry; Tully, Kylemore and Dawros River, Connemara, Galway.

18. **V. ochrostoma** Mudd Man. p. 290 (1861).—Thallus thickish, crustaceous, warted and wrinkled, cracked-areolate, varying in colour from dusky-cream or grey to olive, brownish-black or umber. Perithecia immersed, then partly emergent, black (brownish at an early stage); perithecial wall thin, entire; spores oblong or elliptical, 0,018–22 mm. long, 0,010 mm. thick. —Cromb. Lich. Brit. p. 111; Leight. Lich. Fl. p. 424; ed. 3, p. 454. *Sagedia ochrostoma* Borr. ex Leight. Angioc. Lich. p. 23, t. 7, fig. 4 (1851).

Very similar in the appearance of the thallus to some states of the preceding, of which it is perhaps only a form. The perithecia are brownish when young.

Hab. On mortar of walls.—*B. M.* Near Henfield, Sussex (the only locality).

19. **V. macrostoma** DC. Fl. Franc. ii. p. 313 (1805).—Thallus tawny-brownish, cartilaginous, rather thick, cracked-areolate, the areolæ subsquamulose or raised into irregular warts. Perithecia

black, rather large, immersed in the areolæ, with more or less prominent ostioles; perithecial wall black, thick above, spreading at the base with a thinner layer underneath; spores ellipsoid, rather large, 0,025–35 mm. long, 0,012–15 or –20 mm. thick. —Leight. Angioc. Lich. p. 48, t. 21, fig. 4 & Lich. Fl. p. 423; ed. 3, p. 454 (spore measurements too small). *V. nigrescens* var. *macrostoma* Nyl. in Maine et Loire Mém. Soc. Acad. iv. p. 24 (1858); Mudd Man. p. 289; Cromb. Lich. Brit. p. 110.

Exsicc. Mudd n. 278; Larb. Lich. Cæsar. n. 97.

Distinguished from allied species by the subsquamulose brown thallus.

Hab. On walls and mortar.—*Distr.* Not common in the Channel Islands, S.W. and N. England, rare in Scotland and Ireland.—*B. M.* Alderney; St. Aubin's and St. Brelade's, Jersey; near Penzance, Cornwall; Falmer, Climping and Danny, Sussex; Stratton near Cirencester and Cowcombe Wood, Gloucestershire; near Shrewsbury, Shropshire; Worcester; near Guisboro', Cleveland, Yorkshire; Middleton, Cork.

Form **aphanostoma** Shackleton & Hebden in Naturalist 1892, p. 17.—Differs from the species in the smaller ostioles and in the somewhat larger spores, 0,026–36 mm. long, 0,016–20 mm. thick. Specimen not seen.

Hab. On mortar, wall-tops and sandstone (Cullingworth and Malsis, Crosshills, Yorkshire).

20. **V. thrombioides** Leight. Lich. Fl. ed. 3, p. 452 (1879). — Thallus brownish-red, cartilaginous, shining, becoming cracked-areolate, effuse. Perithecia large, black, immersed, the apex projecting, depressed; perithecial wall thick and black, dimidiate with a thin black layer beneath the base; spores broadly oblong or oblong-ellipsoid, rather large, 0,024–30 mm. long, 0,014–16 mm. thick or rather larger.—*Lithoicea thrombioides* Baglietto ex Massal. Symm. Lich. p. 89 (1855). Specimen not seen.

Leighton records a specimen collected by W. Joshua in Cowcombe Wood, Gloucestershire, but the one in the British Museum that bears that label is identical with *V. macrostoma*.

Hab. On walls.—*Distr.* W. England (Cowcombe Wood, Gloucestershire), fide Leighton.

21. **V. aquilella** Nyl. in Flora lix. p. 237 (1876).—Thallus reddish-brown, minutely areolate or areolate-granulate, thin. Perithecia almost superficial; perithecial wall black, dimidiate; spores ellipsoid, simple, 0,018–22 mm. long, 0,007–9 mm. thick.—Cromb. in Journ. Bot. xiv. p. 362 (1876) & in Grevillea v. p. 29; Leight. Lich. Fl. ed. 3, p. 451.

The specimens of this and the following species in the British Museum were collected at the same time and place as the type

specimens and agree outwardly with the descriptions given, but the spores, though at first simple, become finally 1- or more-septate.

Hab. On micaceous rocks.—*B. M.* Lough Feagh, Connemara (the only locality).

22. **V. fusco-cinerascens** Nyl. in Flora lix. p. 310 (1876).—Thallus greyish-brown, cracked-areolate, unequal, thin. Perithecia black, semi-immersed; perithecial wall entirely black; spores oblong, 0,022–27 mm. long, 0,008–010 mm. thick.—Cromb. in Grevillea v. p. 29; Leight. Lich. Fl. ed. 3, p. 457.

Hab. On micaceous rocks.—*B. M.* Connemara, Galway (the only locality?).

Thallus crustaceous or cartilaginous, continuous or cracked-areolate, determinate.

23. **V. nigrescens** Pers. in Ust. Ann. Bot. xiv. p. 36 (1795).—Thallus brown or nearly black, tartareous, cracked-areolate, or uneven, thin or thickish, determinate, with a black hypothallus. Perithecia of a medium size, immersed, then more or less projecting, usually numerous; perithecial wall entire, thick above, spreading at the base, with a thinner layer below; spores oblong, 0,015–24 mm. long, 0,005–9 mm. thick or occasionally larger; hymenial gelatine wine-red with iodine.—Hook. in Sm. Engl. Fl. v. p. 155; Leight. Angioc. Lich. p. 62, t. 27, fig. 1 & Lich. Fl. p. 420; ed. 3, p. 450; Mudd Man. p. 289; Cromb. Lich. Brit. p. 110 pro parte. *V. umbrina* Ach. Meth. p. 122 (1803) (non Schær.); Tayl. in Mackay Fl. Hib. ii. p. 93. *V. neglecta* Deakin in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 32, t. 1, fig. 1 (1854). *V. ovata* Deak. tom. cit. p. 34, t. 2, fig. 4. *Lichen umbrinus* Ach. Lich. Suec. Prod. p. 14 (1798); Sm. Engl. Bot. t. 1499. *Pyrenula nigrescens* Ach. Syn. p. 126 (1814); Hook. Fl. Scot. ii. p. 46; S. F. Gray Nat. Arr. i. p. 494.

Exsicc. Mudd n. 277; Leight. n. 101 (as *V. umbrina*).

The thallus varies in colour from brownish-grey to dark-reddish-brown or dull-brownish-black. The hypothallus forms a black line at the edge, but occasionally, as on flints, it is rather spreading.

Hab. On rocks, stones, bricks, mortar, &c., especially in calcareous districts.—*Distr.* Frequent in the Channel Islands, England and Wales, somewhat rare in Scotland and Ireland.—*B. M.* St. Merryn, Cornwall; Shanklin, I. of Wight; Torquay, Devon; Lyme Regis, Dorset; Goring, Brighton and Malling Down, Sussex; Reigate and Shiere, Surrey; Little Baddon and Epping Forest, Essex; Dyke Hill, Oxfordshire; Knightsford Bridge and Malvern, Worcestershire; near Chepstow, Monmouthshire; Tenby, Pembrokeshire; Llanymynech, Shropshire; Pwlheli, Diganwy, near Conway and Nevin, Carnarvonshire; Carlton Bank and Ayton, Cleveland, Yorkshire; Ben Lawers, Perthshire; Ringaskiddy and near Cork; Ballinakill, Galway.

24. **V. mauroides** Schær. Spicil. Lich. Helv. p. 335 (1836).—Thallus thin, dark umber-brown, subdeterminate, continuous or

faintly cracked-areolate. Perithecia small, numerous, immersed in the thallus, scarcely emergent, hemispherical, black; perithecial wall continuous under the base in a thin black layer; spores oblong-ellipsoid, 0,016–22 mm. long, 0,008–010 mm. thick.—Leight. Lich. Fl. p. 420: ed. 3, p. 450. *V. umbrina* Leight. Angioc. Lich. p. 52, t. 23, fig. 2 (1850) (non Ach.)? *V. Leightonii* var. *umbrina* Mudd Man. p. 287 (1861)? *V. margacea* var. *mauroides* Cromb. Lich. Brit. p. 112 (1870).

Frequently regarded as a subspecies or variety of the preceding, but distinguished by the thinner more effuse less areolate thallus, the minute areolæ being more easily seen when moist.

Hab. On rocks and stones chiefly arenaceous or quartzose.—*Distr.* Not common throughout England and Wales.—*B. M.* Levie and Wanlip, Leicestershire; Malvern, Worcestershire; Carlton Bank and near Ayton, Cleveland, Yorkshire.

25. **V. cataleptoides** Nyl. in Bull. Soc. Bot. Fr. x. p. 268 (1863).—Thallus thickish, dark-brown or blackish, cracked-areolate, determinate. Perithecia immersed in the thallus, becoming emergent and prominent; perithecial wall black or brownish-black; spores ellipsoid, narrower at the ends, 0,018–24 mm. long, 0,010–12 mm. thick.—*V. margacea* var. *cataleptoides* Nyl. in Maine et Loire Mém. Soc. Acad. iv. p. 26 (1858).

Hab. On rocks, granitic or schistose.

Form **ferruginosa** Lamy Catal. Lich. p. 160 (1880).—Thallus bright ochraceous-red, cracked-areolate; spores 0,018 mm. long, 0,008 mm. thick.—Shackleton & Hebden in Naturalist, 1892, p. 17. Specimen not seen.

The specimen from Yorkshire had spores 0,019–23 mm. long, 0,009–011 mm. thick.

Hab. On limestone crags (Malham, Yorkshire).

26. **V. coerulea** DC. Fl. Franc. ii. p. 318 (1805); Schær. Enum. p. 216 (1850).—Thallus bluish-lead-coloured, greyish or greyish-brown, rather thick, determinate, faintly cracked-areolate. Perithecia black, small, semi-immersed, scarcely prominent, slightly depressed at the ostiole; perithecial wall thick, entire; spores ellipsoid or oblong, 0,014–19 mm. long, 0,004–7 mm. thick; hymenial gelatine wine-red with iodine.—*V. plumbea* Ach. Lich. Univ. p. 285 (1810); Hook. in Sm. Engl. Fl. v. p. 153 (1833); Tayl. in Mackay Fl. Hib. ii. p. 91; Leight. Angioc. Lich. p. 45, t. 19, fig. 5 & Lich. Fl. p. 421; ed. 3, p. 452; Deakin in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 36, t. 3, fig. 8 (1854); Mudd Man. p. 288 (incl. var. *cineracea*); Cromb. Lich. Brit. p. 111. *Lichen coeruleus* Ramond ex. DC. *l. c.* *L. plumbosus* Sm. Engl. Bot. t. 2540 (1813). *Lithocia plumbea* S. F. Gray Nat. Arr. i. p. 497 (1821).

Exsicc. Mudd n. 275 (as *V. plumbea* var. *cineracea*).

The thickish, sometimes orbicular thallus is limited and occasionally intersected by the dark-coloured hypothallus.

Hab. On calcareous rocks.—*Distr.* Uncommon in W. and N. England, W. Scotland and in S. and W. Ireland.—*B. M.* Houghton, Gloucestershire; Buxton, Derbyshire; near Rievaulx and Newton Wood, Cleveland, Yorkshire; Craig Tulloch, Perthshire; I. of Lismore, Argyll; Kenmare, Kerry; Dromoland, Clare.

27. **V. murina** Leight. Angioc. Lich. p. 44, t. 19, fig. 3 (1851).—Thallus mouse-grey or brownish, thin, effuse, continuous and slightly pulverulent or occurring in spots and determinate. Perithecia small, numerous, semi-immersed, prominent; perithecial wall thickish, black, entire; spores ellipsoid, 0,018–24 mm. long, 0,006–12 mm. thick.—Mudd Man. p. 291; Cromb. Lich. Brit. p. 115; Leight. Lich. Fl. p. 425; ed. 3, p. 455. *V. myriocarpa* Hepp Flecht. Eur. n. 430 (1857); Leight. Lich. Fl. ed. 3, p. 456. *Exsicc.* Larb. Lich. Hb. n. 160 (as *V. myriocarpa*).

Distinguished by the thin continuous thallus and numerous almost superficial perithecia. Sometimes a black hypothallus forms a line at the circumference.

Hab. On rocks.—*Distr.* Rare in S. and N. England and in S. and W. Ireland.—*B. M.* Gloucestershire; Hartlepool, Durham; Cleghan, Connemara, Galway.

Var. **pusilla** Arn. in Flora xlvii. p. 599 (1864).—Thallus bluish-grey, thin, somewhat pulverulent. Perithecia as in the species; spores smaller, 0,012–15 mm. long, 0,005–6 mm. thick.—*Verrucaria fugax* Deakin in Ann. & Mag. Nat. Hist. ser. 2, xiii. p. 35 (1854).

Hab. On calcareous rocks.—*Distr.* Rare in S.W. England.—*B. M.* Torquay, Devon.

28. **V. pinguicula** Massal. in Lotos vi. p. 80 (1856); emend. Koerb. Parerg. p. 379 (1863).—Thallus in determinate patches, cartilaginous, continuous or finely cracked-areolate, umber-brown, limited by a dark line. Perithecia minute, hemispherical, immersed, the apex only visible; spores ellipsoid, minute, 0,012 mm. long, 0,004 mm. thick.

Described by Massalongo as having a deeply cracked thallus, and redescribed as above by Koerber, who says (*l. c.*) that Massalongo's description was incorrect.

Hab. On calcareous rocks.—*B. M.* Bilsdale, Yorkshire.

29. **V. peloclita** Nyl. in Flora, lx. p. 461 (1877).—Thallus grey or greyish-brown, thin, smooth, cracked-areolate, determinate. Perithecia semi-immersed, becoming rather prominent; perithecial wall black, entire; spores oblong, rather small, 0,011–15 mm. long, 0,005–6 mm. thick.—Cromb. in Grevillea vi. p. 114; Leight. Lich. Fl. ed. 3, p. 452.

Considered by Nylander (*l. c.*) as closely allied to *V. truncatula*, a Pyrenean lichen. It strongly resembles *V. coerulea*, but with smaller spores.

Hab. On calcareous rocks.—*B. M.* Twelve Pins, Kylemore, Connemara, Galway.

Form **continuella** Nyl. ex Shackleton & Hebden in Naturalist, 1892, p. 17.—Thallus white, continuous. Specimen not seen.

Hab. On damp rocks (Malham, Yorkshire).

30. **V. glaucina** Ach. Syn. p. 94 (1814).—Thallus glaucous or leaden-grey, thickish, crustaceous-cartilaginous, deeply cracked-areolate, determinate, the areolæ smooth, plane, edged with the predominant blackish hypothallus. Perithecia blackish, immersed one or more in each areola, sometimes confluent, the ostiole becoming somewhat prominent; perithecial wall black, entire; spores ellipsoid, 0,010–20 mm. long, 0,005–8 mm. thick.—Leight. Lich. Fl. p. 423; ed. 3, p. 453. *V. polysticta* Borr. in Sm. Engl. Bot. Suppl. t. 2741 (1832) (text); Tayl. in Mackay Fl. Hib. ii. p. 94; Leight. Angioc. Lich. p. 49, t. 21, fig. 5 & Lich. Fl. p. 422; ed. 3, p. 453; Cromb. Lich. Brit. p. 111. *V. viridula* var. *glaucina* Ach. Lich. Univ. p. 675 (1810); Cromb. Lich. Brit. p. 111. *V. fuscella* var. *glaucina* Schær. Enum. p. 215 (1850); Mudd Man. p. 289. *Lithocia glaucina* S. F. Gray Nat. Arr. i. p. 497 (1821). *Endocarpon polystictum* Borr. *l. c.* (plate).

Exsicc. Larb. Lich. Hb. n. 238 (as *V. polysticta*).

Often confused with *V. fuscella* on account of the predominant hypothallus which is visible more or less through the cracks of the grey thallus and gives the whole plant a dark appearance.

Hab. On calcareous rocks and walls.—*Distr.* Not uncommon in the Channel Islands and S. England, rare in N. and W. England, also recorded from N. and S.W. Ireland.—*B. M.* Alderney; Plymouth, Devon; Little Danny, Glynde, Hurst and Falmer, Sussex; Luccomb, I. of Wight; Lenham, Kent; St. Vincent's, near Bristol, Gloucestershire; Llanymynach, Shropshire; Saffron Walden, Essex; Northampton; Bilsdale, Yorkshire; near Cromer, Norfolk; near Stanhope, Durham.

Subsp. **canella** A. L. Sm.—Almost similar to the species but with larger somewhat fusiform spores, colourless, becoming brownish, 0,025–32 mm. long, 0,007–011 mm. thick.—*Verrucaria canella* Nyl. in Flora lxvi. p. 102 (1883); Cromb. in Grevillea xii. p. 91. Specimen not seen.

Hab. On calcareous rocks.—*Distr.* Rare in N. Wales (Bangor, Carnarvonshire).

31. **V. fuscella** Ach. Lich. Univ. p. 289 (1810).—Thallus dark-greyish-brown, thickish, cartilaginous, deeply cracked-areolate, the areolæ smooth, bordered with black from the predominant hypothallus, determinate. Perithecia minute, im-

mersed in the areolæ, the ostiole nearly plane or depressed, scarcely visible; perithecial wall pale-brownish-coloured; spores 8 in the ascus, oblong-ellipsoid, simple, then occasionally becoming 1-septate, 0,011–16 mm. long, 0,004–6 mm. thick.—Mudd Man. p. 288 (excl. var. *glaucina*); Cromb. Lich. Brit. p. 111; Leight. Lich. Fl. p. 422; ed. 3, p. 453. *Lichen fuscellus* Turn. in Trans. Linn. Soc. vii. p. 90, t. 8, fig. 2 (1804); Engl. Bot. t. 1500. *Endocarpon fuscellum* Ach. tom. cit. p. 675; Hook. in Sm. Engl. Fl. v. p. 159 (excl. syn. *E. tephroides* var. *polythecium*); Tayl. in Mackay Fl. Hib. ii. p. 101. *Sagedia fuscella* Fr. Lich. Eur. p. 413 (1831); Leight. Angioc. Lich. p. 22, t. 7, fig. 2.

Exsicc. Mudd n. 276.

Differs from the preceding in the brown thallus and in the lighter-coloured perithecia. The spores sometimes become distinctly 2-celled, suggesting affinity with the genus *Thelidium*, but in many specimens they remain constantly simple, and on that account it has been retained among the *Verrucariæ*.

Hab. On calcareous rocks, mortar of old walls, &c.—*Distr.* Rare in the Channel Islands, S. and N. England, N. Wales, Central Scotland and S.W. Ireland.—*B. M.* Boulay Bay and Trinity, Jersey; Rustington, Sussex; Eaton, Berks; near Oswestry and Llanymynech, Shropshire; near Yarmouth; near Stanhope, Durham; Ireland.

Thallus membranaceous, continuous, smooth.

32. **V. maculiformis** Krempelh. in Flora xli. p. 303 (1858).—Thallus very thin, olive-brown or blackish, forming small spots on the stone, which are often confluent. Perithecia small, semi-immersed, subglobose, becoming slightly depressed round the minute ostiole, black and shining; perithecial wall dimidiate; spores ellipsoid, 0,014–24 mm. long, 0,006–010 mm. thick.

Distinguished by the thin olivaceous thallus and the numerous shining black perithecia.

Hab. On calcareous rocks, flints, &c.—*Distr.* Rare in S., Central and N. England.—*B. M.* Near Cirencester, Gloucestershire; Norton near Worcester; below Cader Idris, Merioneth; Carlton and near Ayton, Cleveland, Yorkshire; Hartlepool, Durham.

33. **V. mutabilis** Borr. ex Leight. Angioc. Lich. p. 55, t. 24, fig. 3 (1851) (excl. syn.).—Thallus dark-brown, like an oily stain, thin, filmy, membranaceous, continuous, smooth, subdeterminate or effuse, often nearly evanescent. Perithecia brownish-black, minute, scattered, prominent, hemispherical, sometimes polished and shining, internally pale; perithecial wall dimidiate; spores oblong, small, 0,008–012 mm. long, 0,005–7 mm. thick.—Mudd Man. p. 293 (excl. syn.); Leight. Lich. Fl. p. 418; ed. 3, p. 448.

Has been confused with other forms on account of the variable thallus. The thallus is thin and almost evanescent in the British Museum specimen.

Hab. On rocks, stones and pebbles.—*B. M.* Mayfield, Sussex.

Thallus tartareous, thin; perithecia not forming pits in the rocks.

34. **V. Dufourii** DC. Fl. Fr. ii. p. 318 (1805).—Thallus whitish or brownish-grey, tartareous, thin, continuous, smooth, determinate, sometimes with a black line at the edge. Perithecia moderate in size, numerous, prominent, hemispherical, depressed round the ostiole; perithecial wall dimidiate; spores ellipsoid, 0,015–22 mm. long, 0,006–010 mm. thick, or rather larger, hymenial gelatine wine-red with iodine.—Leight. Angioc. Lich. p. 76 & Lich. Fl. p. 415; ed. 3, p. 446; Mudd Man. p. 290; Cromb. Lich. Brit. p. 113. *V. concinna* Borr. in Engl. Bot. Suppl. t. 2623, f. 1 (1830); Tayl. in Mackay Fl. Hib. ii. p. 90; Hook. in Sm. Engl. Fl. v. p. 152; Leight. Angioc. Lich. p. 50, t. 22, fig. 3 & p. 76.

Characterized by the almost superficial umbilicate perithecia.

Hab. On calcareous rocks.—*Distr.* Not common in Central and N. England, N. Wales, Scotland and Ireland.—*B. M.* Cheddar Cliffs, Somerset; Minchinhampton, Gloucestershire; Buxton, Derbyshire; Lamplugh, Cumberland; I. of Lismore, Argyll; Middleton, near Cork; Dunkerron, Kerry; Glenarm, Antrim.

35. **V. malhamensis** Nyl. ex Shackleton & Hebden in Naturalist, 1892, p. 17.—Thallus whitish-grey, thin, continuous. Perithecia black, prominent, depressed round the ostiole; spores oblong, 0,014–16 mm. long, 0,005–6 mm. thick. Specimen not seen.

According to Nylander (*l. c.*) similar in appearance to the preceding with affinities with *Verrucaria pulicaris*.

Hab. Damp shady rocks near the ground (Malham, Yorkshire).

36. **V. prominula** Nyl. ex Mudd Man. p. 291 (1861) emend.—Thallus thin, greenish-white or brownish, tartareous, continuous, wrinkled, effuse or determinate. Perithecia large, prominent, scattered, subglobose or conical, black, depressed-umbilicate at the apex; perithecial wall entire; spores broadly oblong or ellipsoid, blunt at the ends, 0,018–20 mm. long, 0,007–010 mm. thick.—Carroll. in Journ. Bot. iv. p. 25 (1866); Cromb. Lich. Brit. p. 113; Leight. Lich. Fl. p. 419; ed. 3, p. 449.

Hab. On maritime rocks.—*Distr.* Rare in S. England and in S.W. Ireland.—*B. M.* Kerry; Kilkee, Clare; Derryclare, Connemara, Galway; Moher, Clare.

Var. **viridans** Nyl. in Flora, lxii. p. 224 (1879).—Thallus and perithecia as in the species; spores broadly oblong or almost globose, much smaller, 0,010–12 mm. long, 0,007–9 mm. thick.—Cromb. in Grevillea viii. p. 30. *V. muralis* Tayl. in Mackay Fl. Hib. ii. p. 91 (1836) pro parte.

Exsicc. Larb. Lich. Hb. (without a number).

Mudd's measurements are not trustworthy; those given for the species are from specimens in the herbarium; the variety differs in the size and form of the spores.

Hab. On maritime rocks.—*Distr.* Rare in S. and W. Ireland.—*B. M.* Kerry; Kilkee, Clare; Leenane, Doughruagh, Connemara, Galway.

Var. **minor** A. L. Sm.—Thallus tartareous, very thin, greyish or brownish. Perithecia smaller than in the species, numerous, thinly scattered, hemispherical, shining black; spores ellipsoid, colourless, 0,014–17 mm, long, 0,006–7 mm. thick.

Resembling the species in habitat and type of thallus, but with smaller perithecia and spores.

Hab. On rocks near the sea.—*Distr.* S.W. coast of Wales; Manorbeer, Tenby, Pembrokeshire.

37. **V. limitata** Krempelh. Lich. Fl. Bay. p. 241 (1861).—Thallus tartareous-farinose, thin, glaucous-grey or brownish-grey, continuous, irregularly traversed and limited by rather wide brown or blackish lines. Perithecia minute, semi-immersed in the thallus, hemispherical; perithecial wall dimidiate; spores ellipsoid, small, 0,012–14 mm. long, 0,006 mm. thick.—Shackleton & Hebden in Naturalist, 1892, p. 17.

Differing in colour and form of the thallus from other species with limited thallus and from *V. muralis*, to which it is allied in the character of the perithecia, by the much smaller spores.

Hab. On limestone and other rocks.—*Distr.* Rare in N. England.—*B. M.* Hartlepool, Durham.

38. **V. muralis** Ach. Meth. p. 115 (1803).—Thallus effuse, white or greyish, tartareous, pulverulent, thin, sometimes faintly cracked-areolate, often evanescent. Perithecia black, hemispherical, small, semi-immersed; perithecial wall dimidiate, thick, somewhat spreading at the base, with a thin brown wall below the base; spores ellipsoid, 0,017–25 mm. long, 0,010–12 mm. thick, or slightly smaller.—Hook. in Sm. Engl. Fl. v. p. 154 pro parte? Tayl. in Mackay Fl. Hib. ii. p. 91 pro parte? *V. patula* Leight. Angioc. Lich. p. 61, t. 26, fig. 1 (1851). *V. rupestris* subsp. *muralis* Nyl. in Maine et Loire Mém. Soc. Acad. iv. p. 32 (1858); Cromb. Lich. Brit. p. 114. Var. *muralis* Mudd Man. p. 292 (1861); Leight. Lich. Fl. p. 426; ed. 3, p. 456.

The perithecia though slightly immersed in the thallus are superficial on the substratum, and do not leave pits in the stone. Specimens are occasionally found with smaller spores, 0,015 mm. long, 0,007 mm. thick.

Hab. On brick walls, stones, mortar, &c.—*Distr.* Not uncommon in the Channel Islands and throughout England, rare in Scotland and Ireland.—*B. M.* Noirmont, Jersey; Luccomb, I. of Wight; Worthing and Downs, Sussex; Minchinhampton, Gloucestershire; Much Wenlock, Shropshire; Norton and Malvern, Worcestershire; Carlton Bank and Ayton, Cleveland, Yorkshire; Penmanshiels, Berwickshire; near Cork; Ballynahinch near Kylemore, Connemara, Galway.

Thallus tartareous, thin; perithecia forming pits in the rocks.

39. V. **rupestris** Schrad. Spicil. p. 109 (1794) pro parte; DC. Fl. Franc. ii. p. 317 (1805).—Thallus white or greyish-white or brownish, effuse, thin, tartareous, pulverulent. Perithecia moderate in size, black, numerous, hemispherical, semi-immersed, leaving shallow pits in the stone; perithecial wall dimidiate, a thin brown wall passing under the base; spores ellipsoid-oblong, 0,018–30 mm. long, 0,008–013 mm. thick.—Hook. in Sm. Engl. Fl. v. p. 152; Tayl. in Mackay Fl. Hib. ii. p. 90; Mudd Man. p. 291; Cromb. Lich. Brit. p. 114 (excl. vars.); Leight. Lich. Fl. p. 425; ed. 3, p. 456 (excl. vars.).

Nearly allied to the following species but with smaller dimidiate perithecia, which are somewhat prominent and leave very shallow pits when they drop out at maturity.

Hab. On stones and rocks, chiefly calcareous.—*Distr.* Frequent throughout the British Islands.—*B. M.* Torquay, Devonshire; Rottingdean and Newhaven, Sussex; Sapperton, Gloucestershire; Twycross, Leicestershire; Trefriw, Carnarvonshire; Appin, Argyll; Middleton, Cork.

Var. **subalbicans** Mudd Man. p. 292 (1821).—Thallus greyish-white, thin, pulverulent. Perithecia slightly larger than in the species and with a more developed wall below the base, leaving scarcely perceptible pits in the substratum; spores as in the species.—Leight. Lich. Fl. p. 426; ed. 3, p. 457. *V. subalbicans* Leight. Angioc. Lich. p. 56, t. 25, fig. 1 (1851).

Exsicc. Leight. no. 200.

Difficult to distinguish from *V. integra* except in the persistently smaller spores.

Hab. On mortar, plastered walls, &c.—*Distr.* Rather rare in S. and N. England and N.W. Wales.—*B. M.* Near Ayton, Cleveland, Yorkshire; Bangor, Carnarvonshire.

40. V. **integra** Carroll in Journ. Bot. iv. p. 25 (1866).—Thallus white or greyish-white, subcrustaceous, tartareous, subfarinose. Perithecia black, numerous, moderate in size, semi-immersed, leaving shallow pits in the rock, hemispherical, depressed above; perithecial wall thick, black, somewhat spreading at the base with a thinner black wall beneath the base; spores ellipsoid-oblong, rather large, 0,023–32 mm. long, 0,010–20 mm. thick.—Leight. Lich. Fl. p. 426; ed. 3, p. 457. *V. rupestris* var. *integra* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 429 (1856); subsp. *integra* Nyl. Lich. Scand. p. 276 (1861); Cromb. Lich. Brit. p. 114. *Sagedia ampullacea* Deakin in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 39, t. 4, fig. 11 (1854)?

Differs from *V. rupestris* in the entire perithecial wall and the somewhat large perithecia and spores.

Hab. On rocks, mostly calcareous, mortar, &c.—*Distr.* Rather rare in S., Central and N. England, among the Scottish Grampians

and in S. Ireland.—*B. M.* Downs, Sussex; near Bisley, Sapperton and St. Vincent Rocks, Bristol, Gloucestershire; Llanymynach, Shropshire; Ayton, Cleveland, Yorkshire; Craig Tulloch, Perthshire; I. of Lismore, Argyll; near Cork; Dunkerron, Kerry.

41. **V. dolomitica** Massal. Gen. Lich. p. 22 (1854).—Thallus thin, tartareous-farinose, continuous, greyish- or greenish-white, often with a tinge of rose-colour, usually limited by a dark line. Perithecia semi-immersed in pits, the apex protruding, papillate or truncate; perithecial wall entire; spores rather large, ellipsoid-ovoid, 0,024–36 mm. long, 0,010–15 mm. thick.—*Amphoridium dolomiticum* Massal. Symm. Lich. p. 80 (1855).

Differs from *V. integra* in the more developed limited thallus and the deeper pits in which the perithecia are immersed.

Hab. On calcareous and other rocks.—*Distr.* Rare in E. and middle England, Central Scotland and S. Ireland.—*B. M.* Suffolk; Derbyshire; near Bath; Hartlepool, Durham; near Edinburgh; Dunkerron, Kerry.

42. **V. marmorea** A. Zahlbr. in Engler & Prantl Nat. Pflanzenf. i. 1*, p. 55 (1903).—Thallus effuse, tartareous, thinnish, continuous, smooth, pale-rose or rose-purple tinged with red. Perithecia moderate in size, black, immersed, then slightly emergent, leaving pits in the stone; spores ovoid, 0,018 mm. long, 0,009 mm. thick.—*V. purpurascens* Hoffm. Pl. Lich. i. p. 74, t. 15, fig. 1 (1790). *V. rupestris* var. *purpurascens* Schær. Enum. p. 217 (1850); Mudd Man. p. 292; Cromb. Lich. Brit. p. 114. *V. calciseda* var. *purpurascens* Leight. Lich. Fl. p. 428; ed. 3, p. 458. *Lichen marmoreus* Scop. Carn. ed. 2, ii. p. 367 (1772) (non With. & non Engl. Bot.).

A doubtful British species. Two specimens have been recorded: one collected by Mudd at Castle Eden, Durham, without spores, with a cracked-areolate thallus and no sign of pitting, probably a form of *V. viridula;* the other corrected by Parfitt at Exeter I have not seen.

Hab. On calcareous rocks.—*Distr.* S.W. and N. England?

43. **V. parva** Deakin in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 33, t. 1, fig. 2 (1854).—Thallus somewhat tartareous, thin, ashy-grey, continuous, effuse. Perithecia minute, globose, black, semi-immersed and leaving shallow pits in the rock; perithecial wall entire; paraphyses mucilaginous, disappearing; asci oblong-elliptical about 0,045 mm. long, 0,017 mm. thick; spores 8 in the ascus, ellipsoid, blunt at the ends, colourless, small, 0,012–17 mm. long, 0,005–7 mm. thick.

Deakin has described and figured the spores as 1-septate, but an examination of his specimen shows them to be simple with sometimes disorganized contents that might simulate septation.

Hab. On limestone rocks.—*B. M.* Torquay, Devonshire (the only locality).

44. **V. calciseda** DC. Fl. Franc. ii. p. 317 (1805).—Thallus effuse, thin, tartareous, subpulverulent, white or greyish-white, often evanescent. Perithecia small, numerous, deeply immersed in the thallus and the rock beneath, leaving pits in the stone, the upper part more or less regularly divided by 4 or 5 fissures; perithecial wall dimidiate; spores ellipsoid, 0,015–21 mm. long, 0,008–010 mm. thick.—Mudd Man. p. 292; Cromb. Lich. Brit. p. 115; Leight. Lich. Fl. 427; ed. 3, p. 458 (excl. var. *purpurascens*). *V. immersa* Hoffm. Pl. Lich. i. p. 58, t. 12, figs. 2–4 (1790)? Tayl. Fl. Hib. ii. p. 90.

Exsicc. Leight. n. 30 (as *V. immersa*).

Distinguished by the fissured apex of the perithecia, on account of which it has been placed by some authors in a separate genus, *Limboria*.

Hab. On calcareous rocks.—*Distr.* Rather uncommon in S. and N. England, rare in Scotland, S. and S.W. Ireland.—*B. M.* Torquay, Devonshire; Landslip, I. of Wight; Laleston near Bridge-end, Glamorganshire; Great Orme's Head, Carnarvonshire; Buxton, Derbyshire; Bilsdale, Yorkshire; Morrone, Braemar; near Cork; Dunkerron and Killarney, Kerry.

Doubtful or parasitic species.

45. **V. Harrimani** Ach. Lich. Univ. p. 284 (1810).—Thallus effuse, tartareous, smooth, mouse-coloured, determinate. Perithecia minute, black, immersed in the substratum, globose, dimidiate depressed round the emerging ostiole; spores ovate, very minute.—Hook. in Sm. Engl. Fl. v. p. 153; Leight. Angioc. Lich. p. 63, t. 19, fig. 4; Deakin in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 38, t. 3, fig. 9 (1854). *Lichen Harrimani* Sm. Engl. Bot. t. 2539 (1814). *Lithocia Harrimani* S. F. Gray Nat. Arr. i. p. 497 (1821). Specimen not seen.

A doubtful species. Considered by Hepp (Flecht. Eur. n. 691) to be synonymous with *V. hiascens*, the spermogoniferous form of *V. Hochstetteri*, which has not been recorded for the British Isles, though probably to be found. The minute spores indicate the spermogonial character of the perithecia, though Deakin (*l. c.*) states that asci are present.

Hab. On hard gray calcareous rocks (Torquay, Devonshire; Durham).

46. **V. pulposa** Leight. Lich. Fl. p. 427 (1871).—Thallus chroolepoid or evanescent. Perithecia blackish, subglobose, pulpose, polished, prominent; epithecium indistinct; perithecial wall dimidiate blackish; spores numerous, fuscous, oblong or irregularly globose, simple; paraphyses very short, crowded; hymenial gelatine untinged with iodine.—Leight. Lich. Fl. ed. 3, p. 457. Specimen not seen.

An aberrant and imperfectly described species.

Hab. On old rails near Shrewsbury, Shropshire.

47. **V. elachistophora** Nyl. in Flora lxi. p. 246 (1878).—Thallus white, unequal, cracked (perhaps not proper). Perithecia (parasitic?) black, partly emergent, slightly depressed above; perithecial wall black, entire; spores 8 in the ascus oblong-ellipsoid, colourless, simple (or sometimes spuriously 1-septate), 0,007–8 mm. long, 0,0035 mm. thick; paraphyses moderate; hymenial gelatine not tinged with iodine.—Cromb. in Grevillea vii. p. 98; Leight. Lich. Fl. ed. 3, p. 454. Specimen not seen.

The presence of paraphyses would exclude this species from the genus, but it requires further investigation.

Hab. On quartzose rocks.—*B. M.* Kylemore, Connemara, Galway (the only locality).

48. **V. conturmatula** Nyl. in Flora lxii. p. 222 (1879).—Thallus indicated by greyish spots. Perithecia small, black, depressed, subconfluent; perithecial wall dimidiate; spores 8 in the ascus, ellipsoid or ovoid-ellipsoid (sometimes obsoletely 1-septate), 0,011–14 mm. long, 0,005–6 mm. thick; hymenial gelatine wine-red with iodine.—Cromb. in Grevillea vii. p. 29.

Nylander considers that the species is possibly parasitic. The specimen in the herbarium of the British Museum is too small and scanty for examination. Larbalestier states that only two small specimens were met with.

Hab. On quartzose rocks in a stream associated with *Lecanora lacustris*.—*B. M.* Near Glencorbet, Connemara, Galway.

V. niveoatra Borr. in Engl. Bot. Suppl. t. 2637, fig. 1 (1830), and **V. mollis** Tayl. in Mackay Fl. Hib. ii. p. 97 (1836) recorded respectively as *Pyrenothea niveoatra* Leight. Angioc. Lich. p. 67, t. 29, fig. 1, and *P. mollis* Leight. *l. c.* t. 29, fig. 2, are the spermogonial condition of other lichens. *V. niveoatra* has been determined by Nylander (Lich. Env. Paris, p. 108 (1896), as the spermogonial state of *Opegrapha cinerea*, a species not otherwise recorded in the British Isles. It has arcuate spermatia measuring 0,012–16 mm. long, 0,001 mm. thick, and in this respect alone differs from *O. vulgata*, in which the spermatia are 0,014–16 mm. long, 0,0005 mm. thick (fide Nyl. *l. c.*); the two species may therefore be considered as identical. A specimen of *V. mollis* from Carig Mt., Kerry, has been determined by Nylander as the spermogonial state of *Opegrapha* sp.

V. lithina Tayl. in Mackay Fl. Hib. ii. p. 92 (1836) (non Ach.) on rocks from Derriquin, Kerry, has been determined as *Pyrenothea lithina* Leight. Angioc. Lich. p. 68, t. 29, fig. 3. *P. lutea* Leight *l. c.* t. 29, fig. 4, collected on trees at Gopsal, Leicestershire, and *P. sulphurea* Leight. tom. cit. p. 69, t. 29, fig. 5, on sandstone rocks, Niton, I. of Wight, are also, judging from the descriptions and figures, spermogonial states of lichens not determined.

106. **THELIDIUM** Massal. Framm. Lich. p. 15 (1855). (Pl. 42.)

Thallus variously crustaceous, uniform, sometimes wanting. Algal cells *Pleurococcus*. Perithecia black, simple, superficial or immersed; paraphyses mucilaginous, soon disappearing; asci usually somewhat large and saccate, 8-spored; spores ellipsoid or ovoid, usually rather large, 2–4-celled, colourless or sometimes brownish.

Spores 1-*septate.*

1. **Th. pyrenophorum** Koerb. Syst. Germ. p. 353 (1855) pro parte, emend. (non Massal.).—Thallus greyish-white or -brown, effuse, thin, slightly cracked when old, sometimes almost obsolete. Perithecia rather large, semi-immersed or superficial, usually depressed round the ostiole; perithecial wall thick, dimidiate, the inner wall brownish; paraphyses disappearing; spores broadly oblong, colourless or pale-yellowish, 1-septate, 0,020–32 mm. long, 0,010–18 mm. thick.—*Th. Borreri* Mudd Man. p. 296 (1861). *Verrucaria pyrenophora* Ach. Lich. Univ. p. 285 (1810); *V. Dufourii* Borr. in Engl. Bot. Suppl. t. 2791 (1831) (non DC.); Tayl. in Mackay Fl. Hib. ii. p. 92; Leight. Angioc. Lich. p. 51. *V. Borreri* Leight. tom. cit. p. 76, t. 22, fig. 4 (1851) & Lich. Fl. p. 429; ed. 3, p. 459; Cromb. Lich. Brit. p. 112 pro parte.

From the similarity in the outward formation of thallus and especially of the perithecia, when well developed apt to be confused with *Th. papulare* and *Verrucaria Dufourii*.

Hab. On calcareous rocks.—*Distr.* Rare in Scottish Grampians and W. Ireland.—*B. M.* Ben Lawers, Perthshire; Morrone, Braemar, Aberdeenshire; Clifden, Connemara, Galway.

2. **Th. mesotropum** A. L. Sm.—Thallus pale, thin, unequal. Perithecia black, somewhat turgid, convex; perithecial wall dimidiate; spores colourless, ovoid or ovoid-oblong, small, 1-septate, 0,012–17 mm. long, 0,005–6 mm thick; hymenial gelatine wine-red with iodine.—*Verrucaria mesotropa* Nyl. in Flora lxix. p. 419 (1866); Leight. in Ann. Mag. Hist. ser. 3, xix. p. 408 (1867) & Lich. Fl. p. 431; ed. 3, p. 459; Cromb. Lich. Brit. p. 115.

Hab. On subalpine rocks.—*Distr.* Rare in hilly districts in W. England and Wales.—*B. M.* Llanymynech Hill, Shropshire.

3. **Th. immersum** Mudd Man. p. 295, t. 5, fig. 123 (1861).—Thallus white, grey-ashy-white or pale-dirty-yellow, thin, tartareous and somewhat farinose, sometimes determinate. Perithecia black, deeply immersed and leaving pits in the rock, depressed round the ostiole; perithecial wall thick above, thinner round the base; spores colourless, ellipsoid, constantly 1-septate, rather large, 0,025–38 mm. long, 0,012–17 mm. thick.—*Verrucaria immersa* Leight. Angioc. Lich. p. 57, t. 25, fig. 2 (1851)

(excl. syn.) & Lich. Fl. p. 436; ed. 3, p. 460. *V. Auruntii* Massal. Gen. Lich. p. 22 (1854) & Symm. Lich. p. 77 (1855); Cromb. Lich. Brit. p. 112.

Exsicc. Mudd n. 283.

The spore characters recorded are both smaller and larger than the size given by Leighton; but the 2-celled spores and the pitted substratum are characteristic of all the forms.

Hab. On calcareous rocks.—*Distr.* Somewhat rare in upland regions.—*B. M.* Hailey Wood and Tetbury near Cirencester, Gloucestershire; Bilsdale, Yorkshire; Morrone, Braemar, Aberdeenshire; Dunkerron, Kerry.

4. **Th. Nylanderi** Krempelh. Lich.-Fl. Bay. p. 246 (1861).—Thallus crustaceous, thin, greyish-green, brighter green when moist and somewhat gelatinous, cracked-areolate, effuse, with a whitish hypothallus. Perithecia small, scattered, black, hemispherical, prominent, at length depressed, the ostiole poriform; perithecial wall dimidiate; paraphyses mucilaginous, disappearing; asci ellipsoid-ovoid, about 0,070 mm. long, 0,025–30 mm. thick; spores 8 in the ascus, ellipsoid, rather blunt at the ends, with yellowish granular contents, 1-septate, 0,022–30 mm. long, 0,009–012 mm. thick.—*Sagedia Nylanderi* Hepp Flecht. Eur. n. 440 (1853). *Verrucaria viridis* Deakin in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 36, t. 3, fig. 7 (1854).

There is only one small specimen collected by Deakin, but it agrees in all essential particulars with Hepp's species.

Hab. On sandstone rocks.—*B. M.* Torquay, Devon.

Spores 3-septate.

5. **Th. cataractarum** Mudd Man. p. 294 (1861).—Thallus greyish-green, effuse, thin, somewhat gelatinous when moist, subleprose when dry, sometimes evanescent. Perithecia small, semi-immersed or nearly sessile, subglobose, soft when moist; perithecial wall dimidiate, black; paraphyses disappearing; spores ellipsoid-oblong, 1–3-septate, colourless or pale-brownish, rather large, 0,021–32 mm. long, 0,010–15 mm. thick.—Cromb. Lich. Brit. p. 112 (excl. syn. *V. margacea* Leight.); Leight. Lich. Fl. p. 429: ed. 3, p. 459. *Sagedia cataractarum* Hepp Flecht. Eur. n. 442 (1857).

Exsicc. Mudd n. 281; Leight. n. 319 (as *Verrucaria margacea*, var.).

Hab. On rocks and stones in streams.—*Distr.* Rare in N. England and in E., S. and W. Ireland.—*B. M.* Near Ayton, Cleveland, Yorkshire; Rosscarbery, Cork.

6. **Th. papulare** Arn. in Flora lxviii. p. 147 (1885).—Thallus greyish or brownish, crustaceous, rather thick and cracked or thinner, furfuraceous and almost continuous, sometimes almost obsolete. Perithecia large, black, semi-immersed or superficial,

usually depressed round the ostiole; perithecial wall dimidiate; paraphyses disappearing; spores ellipsoid, 3-septate, very large, colourless, 0,035–50 mm. long, 0,015–20 mm. thick.—*Th. pyrenophorum* Koerb. Syst. Lich. Germ. p. 353 (1856) pro parte; Mudd Man. p. 294. *Verrucaria papularis* Fr. Lich. Eur. p. 434 (1831) fide Arn. *V. Sprucei* Ch. Bab. ex Leight. Angioc. Lich. p. 54, t. 23, figs. 4–6 (1851). *V. pyrenophora* Leight. tom. cit. p. 76 (non Ach.) & Lich. Fl. p. 442; ed. 3, p. 474; Cromb. Lich. Brit. p. 112 pro parte.

Exsicc. Leight. n. 319; Larb. Lich. Hb. n. 240.

Often confused with *Th. pyrenophorum*, which it resembles in the outward appearance of thallus and perithecia, but distinguished by the larger 3-septate spores. Leighton's note in Angioc. Lich. p. 76, in which he states that he had examined an authentic specimen of *V. pyrenophora* Ach., is at variance with Nylander's description of that species (Maine et Loire Mém. Soc. Acad. iv. p. 26 (1858)), and with the Acharian specimens at the Linnean Society.

Hab. On rocks in damp upland regions.—*Distr.* Rare throughout England, Scotland and Ireland, not recorded from the Channel Islands. —*B. M.* Whitecliffe Rocks near Ludlow, Craigforda and Llanymynech, Shropshire; Egremont and Lamplugh, Cumberland; Craig Calliach, Perthshire; Rosscarberry Rocks, Cork; Ballaghbeana Gap, Kerry; Doughruagh Mts. and Kylemore, Connemara, Kerry; Armagh.

7. **Th. microcarpum** A. L. Sm.—Thallus whitish, slightly greenish or greyish, farinose or evanescent. Perithecia minute, black, solitary or congregate, hemispherical, sessile, opening by a pore; perithecial wall dimidiate; paraphyses none; spores colourless, oblong-ellipsoid, 3-septate, 0,026–32 mm. long, 0,012–14 mm. thick; hymenial gelatine wine-red with iodine.—*Verrucaria microcarpa* Davies ex Leight. Lich. Fl. p. 442 (1871); ed. 3, p. 474.

Hab. On chalk.—*Distr.* Rare in S. England.—*B. M.* Beeding Downs, Plumpton Downs and Glynde, Sussex.

8. **Th. incavatum** Mudd Man. p. 295, t. 5, fig. 122 (1861).—Thallus greyish-white, tartareous, thin, smooth or somewhat farinose, continuous. Perithecia black, hemispherical-globose, with a large ostiole, deeply immersed, leaving pits in the rock; perithecial wall entire; paraphyses disappearing; spores ellipsoid-oblong, colourless, 3-septate, sometimes constricted at the septa, 0,035–53 mm. long, 0,012–21 mm. thick.—*Verrucaria pyrenophora* var. *incavata* Nyl. ex Mudd *l. c.*; Cromb. Lich. Brit. p. 112. *Verrucaria incavata* Leight. Lich. Fl. p. 445; ed. 3, p. 476.

Exsicc. Mudd n. 282.

Distinguished from *Th. papulare* by the pit-forming perithecia. The spores in the specimens examined are smaller than the measurements given by Leighton *ll. c.*, varying in size from 0,035–40 mm. long and 0,012–15 mm. thick.

Hab. On calcareous rocks.—*Distr.* Rare in N. England, Wales and W. Ireland.—*B. M.* Buxton, Derbyshire; Bilsdale, Yorkshire.

Doubtful or parasitic.

9. **Th. sparsulum** A. L. Sm.—Thallus indistinct. Perithecia scattered, minute, subglobose; perithecial wall entire; asci somewhat saccate; paraphyses mucilaginous, disappearing; spores colourless, ellipsoid, becoming 3-septate, 0,023–27 mm. long, 0,010–13 mm. thick.—*Verrucarina sparsula* Nyl. in Flora lx. p. 231 (1877); Cromb. in Grevillea vi. p. 20. *Verrucaria sparsula* Leight. Lich. Fl. ed. 3, p. 478.

The extremely minute perithecia are scattered over the substratum either on the stone or on a thinly furfuraceous dark-brownish layer, a mixture of various algæ and brown fungal hyphæ. Nylander (*l. c.*) considered the blue-green algæ to be gonidimia and described the lichen under a new genus *Verrucarina* akin to Pyrenidiaceæ. The specimens in the British Museum are somewhat imperfectly developed; the connection is not clear between the perithecia and the gonidimia, and the spores are immature and simple or only 1-septate.

Hab. On chalk.—*Distr.* Rare in S. England.—*B. M.* Lewes, Sussex; Dorking and Reigate, Surrey.

10. **Th. superpositum** A. L. Sm.—Thallus none. Perithecia minute, almost superficial, black, depressed globose, with a poriform ostiole; perithecial wall entire; paraphyses mucilaginous, disappearing; ostiolar filaments (periphyses) distinct; asci obovate-ellipsoid; spores 8 in the ascus, colourless, ellipsoid-clavate, 1-septate, 0,017–19 mm. long, 0,006–8 mm. thick; hymenial gelatine wine-red with iodine.—*Verrucaria superposita* Nyl. in Flora xlviii. p. 357 (1865); Carroll in Journ. Bot. iv. p. 25 (1866); Cromb. Lich. Brit. p. 115; Leight. Lich. Fl. p. 462; ed. 3, p. 494.

Hab. Parasitic on *Polyblastia theleodes*.—*B. M.* Ben Lawers, Perthshire (the only locality).

107. **POLYBLASTIA** Massal. Ric. Lich. p. 147 (1852); emend. Lönnr. in Flora xli. p. 630 (1858).—*Sphæromphale* Reichenb. Consp. Reg. Veg. p. 20 (1828) pro parte; Mudd Man. p. 281 pro parte. (Pl. 43.)

Thallus variously crustaceous, not corticated, sometimes developed within the substratum. Algal cells *Pleurococcus*. Perithecia simple, superficial or immersed in the thallus, sometimes embedded in the substratum and leaving pits; ostiole a simple pore; paraphyses mucilaginous, disappearing; asci broadly clavate, 1–8-spored; spores rather large, ellipsoid, muriform, colourless or dark-coloured.

Spores colourless.

1. **P. intercedens** Lönnr. in Flora xli. p. 631 (1858).—Thallus greyish or dark-brownish, tartareous, thin, continuous or faintly cracked, effuse or determined by a black line, sometimes obsolete.

Perithecia moderate in size, black, prominent, immersed at the base, subhemispherical, usually somewhat depressed round the poriform ostiole; perithecial wall dimidiate; paraphyses none; spores 8 in the ascus, colourless, rarely pale brownish, ellipsoid, muriform, the cells numerous, irregular, 0,024–42 mm. long, 0,015–21 mm. thick; hymenial gelatine wine-red with iodine.—*Verrucaria intercedens* Nyl. in Maine et Loire Mém. Soc. Acad. iv. p. 33 (1858); Carroll in Journ. Bot. iii. p. 292 (1865); Cromb. Lich. Brit. p. 114; Leight. Lich. Fl. p. 454; ed. 3, p. 487.

Very variable in appearance according to the form of development. In some specimens the perithecia are strongly umbilicate and are comparable with those of *Verrucaria Dufourii* or *Thelidium papulare;* in others the ostiole is scarcely visible.

Hab. On schistose, arenaceous and calcareous rocks.—*Distr.* Rare in mountainous regions in Scotland and N. England, but also recorded from S. England.—*B. M.* Buxton, Derbyshire; Ben Lawers, Perthshire.

2. **P. spurcella** A. L. Sm.—Very similar to the preceding, except for the thinner, obscurely smoky thallus; spores colourless, murali-locular, 0,022–25 mm. long, 0,011–14 mm. thick.—*Verrucaria spurcella* Nyl. ex Shackleton & Hebden in Naturalist, 1892, p. 17. Specimen not seen.

Hab. Limestone walls (Malham, Gordale, Yorkshire).

3. **P. fuscoargillacea** Anzi in Comm. Soc. Critt Ital. ii. 1, p. 26 (1864).—Thallus brownish- or whitish-grey, thin, effuse, minutely cracked-areolate, becoming farinose. Perithecia black, small, numerous, often crowded, sessile, hemispherical, the base only immersed, the ostiole poriform; perithecial wall dimidiate; paraphyses disappearing; spores 6 to 8 in the ascus, ellipsoid, colourless or faintly yellowish, muriform, 0,018–28 mm. long, 0,011–16 mm. thick; hymenial gelatine reddish with iodine.—*Verrucaria fuscoargillacea* Cromb. in Journ. Bot. ix. p. 179 (1871); Leight. Lich. Fl. p. 455; ed. 3, p. 487.

Hab. On rocks, mostly calcareous.—*Distr.* Rare in W. England, N. Scotland and W. Ireland.—*B. M.* Craig Tulloch, Blair Athole, Perthshire.

Spores colourless becoming brownish.

4. **P. Schraderi** A. L. Sm.—Thallus greyish-white, thin, tartareous and somewhat farinose. Perithecia black, globose, deeply immersed and leaving pits in the rock, the ostiole only slightly emerging; perithecial wall entire; spores 8 in the ascus ellipsoid, muriform, usually 3-septate with an irregular longitudinal division, colourless, becoming brownish, about 0,040–45 mm. long, 0,012–17 mm. thick.—*Lichen Schraderi* Sm. Engl. Bot.

t. 1711 (1807) (non Ach.). *Lithocia Schraderi* S. F. Gray Nat. Arr. i. p. 497 (1821).

The perithecia are thickly scattered over the stone and tend to grow in concentric lines. There are also present on the surface of the stone small groups of *Verrucaria Dufourii*, probably the "male scattered warts" of Smith's description.

Hab. On chalk or calcareous stones.—*B. M.* Sussex (the only locality); specimen collected by W. Borrer.

5. **P. deminuta** Arn. in Flora xliv. p. 264 (1861).—Thallus greyish-white, thin, tartareous. Perithecia globose, minute, black, entirely immersed, leaving pits in the rock, the ostiole slightly prominent; perithecial wall entire; paraphyses none; spores 8, colourless then brown, ellipsoid or broadly oblong, muriform, 0,022–30 mm. long, 0,012–15 mm. thick.—*Verrucaria deminuta* Cromb. in Journ. Bot. xiv. p. 363 (1876); Leight. Lich. Fl. ed. 3, p. 491.

This and the preceding are the only British species of *Polyblastia* that form perithecial pits (foveolate) in the substratum.

Hab. On moist rocks.—*B. M.* Recess Road, Connemara, Galway.

6. **P. inumbrata** A. L. Sm.—Thallus dark-brownish or greyish, thin, effuse, unequal or dispersed. Perithecia moderate in size, semi-immersed, the ostiole projecting, generally with a minute papilla; perithecial wall thick, black, entire; paraphyses mucilaginous, disappearing; spores 8 in the ascus, oblong-ellipsoid, light-yellowish-brown, muriform, large, 0,33–62 mm. long, 0,017–32 mm. thick; hymenial gelatine wine-red with iodine.—*Verrucaria inumbrata* Nyl. in Flora xlvii. p. 355 (1864); Carroll in Journ. Bot. iii. p. 292 (1865); Cromb. Lich. Brit. p. 114; Leight. Lich. Fl. p. 460; ed. 3, p. 492.

Nylander describes the spores as colourless, but in the authentic specimens examined they are a clear light-brown with very distinct 1–3 transverse septa and muriform with small cells.

Hab. On schistose rocks.—*B. M.* Ben Lawers (the only locality).

7. **P. subviridicans** A. L. Sm.—Thallus pale-greenish, thin, continuous and wrinkled. Perithecia black, embedded in large thalline tubercles, the ostiole papillate, small, depressed; perithecial wall dimidiate; paraphyses none; spores 2 or 4 in the ascus, oblong, colourless, muriform, large, 0,046–70 mm. long, 0,024–30 mm. thick.—*Verrucaria subviridicans* Nyl. in Flora lx. p. 566 (1877); Cromb. in Grevillea vi. p. 114; Leight. Lich. Fl. ed. 3, p. 488. Specimen not seen.

Considered by Nylander to be very like the preceding, of which it may be a subspecies. He also states that the thallus contains blue-green algæ (gonimiose); that may however be accidental, and due to the moist habitat.

Hab. On stones in torrents, rare in W. Ireland, near Kylemore, Connemara, Galway.

8. **P. subinumbrata** A. L. Sm.—Thallus greyish-brown, very thin or subevanescent. Perithecia immersed in brownish thalline warts; perithecial wall black, entire; spores similar to those of *P. inumbrata* but smaller, 0,022–30 mm. long, 0,015–18 mm. thick.—*Verrucaria subinumbrata* Nyl. in Flora lxi. p. 246 (1878); Cromb. in Grevillea vii. p. 97; Leight. Lich. Fl. ed. 3, p. 492.

Perhaps only a subspecies of *P. inumbrata* (Nyl. *l. c.*). The specimen in the herbarium of the British Museum collected by Larbalestier at the same locality is a form of *P. scotinospora* with small, very dark, muriform spores.

Hab. On schistose rocks, Kylemore, Connemara, Galway (the only locality).

9. **P. Sendtneri** Krempelh. in Flora xxxviii. p. 67 (1855).—Thallus whitish-grey, cartilaginous, incrusting, granular, unequal. Perithecia black, minute, globose, semi-immersed, the ostiole depressed; perithecial wall entire; paraphyses mucilaginous, disappearing; spores 8 in the ascus, almost colourless or pallid-brownish, ovoid, muriform, 0,015–30 mm. long, 0,009–014 mm. thick; hymenial gelatine wine-red with iodine.—*Verrucaria Sendtneri* Nyl. in Maine et Loire. Mém. Soc. Acad. iv. p. 33 (1858); Carroll in Journ. Bot. iii. p. 292 (1865); Leight. Lich. Fl. p. 459; ed. 3, p. 490.

The colour of the spores seems to vary a great deal, some authors describing them as brownish, in the specimens examined they are almost colourless.

Hab. On mossy earth in alpine regions.—*B. M.* Ben Lawers, Perthshire.

10. **P. gelatinosa** Th. Fr. in K. Svensk. Vetensk. Soc. Nov. Act. 1877, 8, p. 10.—Thallus thinnish, effuse, somewhat gelatinous, dark-brownish or blackish. Perithecia moderate in size, semi-immersed, somewhat prominent, the ostiole slightly depressed; perithecial wall entire; paraphyses mucilaginous, disappearing, ostiolar filaments numerous, distinct; asci saccate-clavate; spores 8 in the ascus, oblong-ellipsoid, pale-brownish or almost colourless, muriform, 0,030–45 mm. long, 0,012–21 mm. thick.—*Verrucaria gelatinosa* Ach. Lich. Univ. p. 283 (1810) (non Nyl. in Maine et Loire Mém. Soc. Acad. iv. p. 21 (1858)). *V. nigrata* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 430 (1856); Cromb. Lich. Brit. p. 110; Leight. Lich. Fl. p. 456; ed. 3, p. 489. *Sphæromphale nigrata* Mudd Man. p. 282 (1861).

Leighton has described the spores as dark-brown, but Nylander includes the species in a section with colourless spores. In the specimens examined they are colourless or slightly brownish.

Hab. On mossy earth in alpine places.—*B. M.* Ben Lawers (the only British locality).

11. **P. tristicula** Th. Fr. tom. cit. p. 14.—Thallus of brown globose or subsquamulose scattered granules. Perithecia black, subglobose, moderate in size, with a punctiform, scarcely visible ostiole; perithecial wall entire, somewhat wrinkled; paraphyses none; spores usually 2 in the ascus, becoming brownish, muriform, large, 0,060–132 mm. long, 0,021–51 mm. thick; hymenial gelatine wine-red with iodine.—*Verrucaria tristicula* Nyl. in Flora xlviii. p. 356 (1865); Carroll in Journ. Bot. iv. p. 24 (1866); Cromb. Lich. Brit. p. 110; Leight. Lich. Fl. p. 456; ed. 3, p. 488.

Hab. On mosses in mountainous regions.—*B. M.* Aviemore, Aberdeenshire.

Spores becoming dark-brown.

12. **P. theleodes** Th. Fr. tom. cit. p. 10.—Thallus greyish-white, thickish, wrinkled-areolate, with thicker wart-like protuberances, sometimes almost disappearing. Perithecia partly enclosed in the warts or superficial, large, hemispherical with a slight depression round the ostiole; perithecial wall black, entire, thicker over the top; paraphyses disappearing; spores 8 in the ascus, broadly ellipsoid, very large, colourless, then dark-brown, muriform, variable, 0,060–84 mm. long, 0,024–45 mm. thick; hymenial gelatine wine-red with iodine.—*Verrucaria theleodes* Sommerf. Suppl. Fl. Lapp. p. 160 (1826); Cromb. Lich. Brit. p. 110; Leight. Lich. Fl. p. 457; ed. 3, p. 489 (incl. f. *verrucoso-areolata*). *V. verrucoso-areolata* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 438 (1856) & in Maine et Loire Mém. Soc. Acad. iv. p. 36 (1858); Carroll in Journ. Bot. iii. p. 292 (1865). *V. subpyrenophora* Leight. Lich. Fl. p. 456; ed. 3, p. 486. *Lecanora atra* var. *verrucoso-areolata* Schær. Enum. p. 73 (1850) fide Nyl. Lich. Scand. p. 292 (1861). *Sphæromphale verrucoso-areolata* Mudd Man. p. 282, t. 5, fig. 119 (1861).

The thallus varies considerably in thickness; sometimes the perithecia are sessile and the thallus scarcely visible. There is a distinct thin blackish wall at the base of the perithecia, the upper portion being much thicker and easily breaking away. The spores are often smaller than the size recorded, occasionally not longer than 0,050 mm.

Hab. On rocks.—*Distr.* Rather rare in alpine districts of the British Isles.—*B. M.* Cwm Idwall, Cwm Cywion and Snowdon, Carnarvonshire; Ben Lawers, Perthshire; Achosragan Hill, Appin, Argyll; Craig Tulloch, Blair Athole, Perthshire; Craig Guie, Braemar, Aberdeenshire.

Form **inundata** Th. Fr. tom. cit. p. 11.—Thallus thin, smooth, somewhat gelatinous. Perithecia semi-immersed in the thallus.—*Verrucaria theleodes* var. *inundata* Nyl. ex Carroll in Journ. Bot. iv. p. 25 (1866); Cromb. Lich. Brit. p. 110; Leight. Lich. Fl. ed. 3, p. 490 (note).

Hab. On moist rocks.—*Distr.* Rare in S.W. Ireland.—*B. M.* Ballaghbeama, Kerry.

13. **P. scotinospora** Hellb. in Vet. Akad. Förh. 1865, p. 478. —Thallus whitish or greyish-brown, warted-areolate, sometimes almost obsolete. Perithecia rather large, sessile, prominent, somewhat depressed round the ostiole; perithecial wall incurved at the base and almost entire; paraphyses disappearing; spores 8 in the ascus, ellipsoid, irregular, muriform, brown, 0,026–40 mm. long, 0,013–21 mm. thick.—*Verrucaria scotinospora* Nyl. Lich. Scand. p. 270 (1861); Cromb. Lich. Brit. p. 110; Leight. Lich. Fl. p. 453; ed. 3, p. 485. *Sphæromphale scotinospora* Mudd Man. p. 282 (1861).

Hab. On schistose rocks.—*Distr.* Rare in alpine regions.—*B. M.* Cwm Clwyd, Denbighshire; Ben Lawers and Ben-y-Gloe, Blair Athole, Perthshire; Kylemore, Connemara, Galway.

14. **P. Henscheliana** Lönnr. in Flora xli. p. 631 (1858).—Thallus greyish or brownish, thin, cracked. Perithecia rather large, subglobose or hemispherical, immersed in the thallus with a black prominent ostiole; perithecial wall black, almost dimidiate; paraphyses disappearing; spores 8 in the ascus, broadly-oblong, becoming dark-brown, muriform, large, 0,046–56 mm. long, 0,023–33 mm. thick; hymenial gelatine wine-red with iodine. - *Sphæromphale Henscheliana* Koerb. Syst. Lich. Germ. p. 336 (1855). *Verrucaria subumbrina* Nyl. Lich. Scand. p. 269 (1861) (fide Th. Fr. in K. Svensk. Vetensk. Soc. Nov. Act. 1877, 8, p. 12); Carroll in Journ. Bot. iii. p. 292 (1865); Cromb. Lich. Brit. p. 109; Leight. Lich. Fl. p. 458; ed. 3, p. 485. *V. Henscheliana* Cromb. in Journ. Bot. ix. p. 179 (1871); Leight. Lich. Fl. p. 457; ed. 3, p. 489.

Exsicc. Larb. Lich. Hb. n. 198.

Hab. On schistose rocks.—*Distr.* Rare in mountainous districts of N. Scotland and W. Ireland.—*B. M.* Ben Lawers, Perthshire; Lough Feagh, Connemara, Galway.

15. **P. nigritella** A. L. Sm.—Thallus black, effuse. Perithecia small, black, semi-immersed, somewhat prominent, the ostiole minute; perithecial wall entire; paraphyses mucilaginous, disappearing; asci elongate-clavate; spores 8 in the ascus, irregularly ellipsoid, dark-brown, variously muriform with few irregular cells, small, 0,21–36 mm. long, 0,09–14 mm. thick (usually 0,020–22 mm. long, 0,010–12 mm. thick); hymenial gelatine wine-red or tawny-yellowish with iodine.—*Verrucaria nigritella* Nyl. in Flora xlviii. p. 357 (1865); Carroll in Journ. Bot. iv. p. 25 (1866); Cromb. Lich. Brit. p. 110; Leight. Lich. Fl. p. 466; ed. 3, p. 497.

Judging from the description similar to if not identical with *P. gothica* (Th. Fr. Bot. Not. 1865, p. 112), which differs somewhat in having more inflated asci and slightly narrower spores. Leighton quotes *Parmelia scruposa* var. *bryophila*, pro parte (Angioc. Lich. t. 11, f. 3B) as representing the spores of this species.

Hab. On peaty earth between the squamules of *Dermatocarpon cinereum*. — *B. M.* Ben Lawers, Perthshire (the only British locality).

16. **P. gothica** Th. Fr. in Bot. Not. 1865, p. 112.—Thallus thin, greenish or dark-coloured, effuse. Perithecia black, small, semi-immersed, the ostiole indistinct; perithecial wall entire; paraphyses indistinct; ostiolar filaments short; ascus rather broad, subventricose; spores ellipsoid, becoming somewhat fusiform, dark-brown, at first 3- then 5–7-septate and irregularly muriform, 0,018–28 mm. long, 0,007–9 mm. thick.—*Verrucaria pituphloia* Leight. Lich. Fl. p. 458 (1871) (fide Th. Fr. in K. Svensk. Vetensk. Soc. Nov. Act. 1877, 8, p. 26). *V. gothica* Leight. tom. cit. ed. 3, p. 490 (1879).

Th. Fries (*l. c.*) recognizes the resemblance of this species to a *Sphæria*. I have been unable to detect gonidia in Leighton's specimen, but the size and structure of the spores agree with Fries's description.

Hab. On decaying mosses and humus (*P. gothica*); on larch-poles (*V. pituphloia*).—*Distr.* Shrewsbury, Shropshire.

17. **P.? peltophora** A. L. Sm. — Thallus squamulose, the squamules thin, green, smooth, either aproximate or scattered. Perithecia black, large, prominent; perithecial wall dimidiate; paraphyses few, filiform, interspersed with oily granules; ostiolar filaments (periphyses) numerous; spores 8 in the ascus, dark-brown, ellipsoid, muriform, rather large, 0,035–48 mm. long, 0,020–30 mm. thick; hymenial gelatine wine-red with iodine.—*Verrucaria peltophora* Stirton in Grevillea iii. p. 37 (1874); Leight. Lich. Fl. ed. 3, p. 486. Specimen not seen.

Hab. On the earth, Ben Lawers, Perthshire.

108. **THROMBIUM** Wallr. Fl. Crypt. Germ. 1, p. 287 (1831); emend. Massal. Ric. Lich. p. 156 (1852). *Inoderma* S. F. Gray Nat. Arr. i. p. 498 (1821) pro parte. *Verrucaria* subgen. *Inoderma* Ach. Lich. Univ. p. 294 (1810). (Pl. 44.)

Thallus crustaceous, uniform, membranaceous, mucilaginous, thin, sometimes developed within the substratum or altogether wanting. Algal cells *Pleurococcus*. Perithecia simple, immersed in the thallus or superficial, the outer wall of a carbonaceous or horny structure, light or dark-coloured, opening by a poriform ostiole; paraphyses slender, branched, persistent; asci 4–8-spored; spores ellipsoid, simple, colourless or brownish.

The only British genus of simple-spored Verrucariaceæ with persistent paraphyses. Acharius's subgenus *Inoderma* represented species of *Verrucaria* with a somewhat soft thallus. S. F. Gray raised it to generic rank and included in it two British species, *I. epigæa* and *I. byssacea*, the latter of doubtful position.

1. **Thr. lætevirens** A. L. Sm.—Thallus forming a broadly effused rather thick inseparable film, smooth, even, rather

gelatinous, bright olive-green, the lobed margin paler and yellowish; gonidia protococcoid, globose, 0,012–15 mm. in diameter. Perithecia minute, crowded, globose, entire, black, completely immersed in the thallus with a minute black ring round the ostiole; asci clavate; spores ellipsoid, simple, colourless, 0,011–12 mm. long, 0,006 mm. thick; paraphyses scanty, slender, cylindrical; spermogones immersed, mixed with the perithecia, with filiform straight sterigmata and simple cylindrical straight spermatia, 0,008–9 mm. long, 0,002 mm. thick. —*Verrucaria lætevirens* Massee in Journ. Bot. xxx. p. 193, t. 324, figs. 1–9 (1892).

Differs from other maritime simple-spored forms in the presence of paraphyses.

Hab. On smooth rocks between tide-marks.—*Distr.* Somewhat rare on Northern, East and West coasts (Berwick-on-Tweed, Northumberland; Burnmouth, Berwickshire; Gareloch, Dumbartonshire; Cumbrae, Buteshire; Loch Goil, Argyll).

2. **Thr. epigæum** Wallr. Naturgesch. Flecht. p. 265 (1825) (nomen) & Fl. Crypt. Germ. i. p. 294 (1831).—Thallus pale-brown, or yellowish-green, thin, effuse, gelatinous when moist, somewhat furfuraceous when dry. Perithecia small, black, globose, immersed in the thallus, the upper part only visible; perithecial wall entire, thicker above; spores oblong, ellipsoid or irregularly ovate, rather large, 0,018–25 mm. long, 0,005–011 mm. thick. —*Sphæria epigæa* Pers. Syn. Fung. Add. p. xxvii. (1801). *Verrucaria epigæa* Ach. Meth. p. 123 (1803); Hook. in Sm. Engl. Fl. v. p. 155; Tayl. in Mackay Fl. Hib. ii. p. 96; Leight. Angioc. Lich. p. 64, t. 27, fig. 4 & Lich. Fl. p. 415; ed. 3, p. 446; Mudd Man. p. 293; Cromb. Lich. Brit. p. 116. *Lichen terrestris* Sm. Engl. Bot. t. 1681 (1807). *Inoderma epigæa* S. F. Gray Nat. Arr. i. p. 498 (1821).

Hab. On soil.—*Distr.* Rather rare throughout the British Isles.—*B. M.* Hassocks, Maresfield and Tilgate, Sussex; Cradley, Herefordshire; Hales End near Malvern, Worcestershire; Ross, Clare; Connemara, Galway.

3. **Thr. thelostoma** A. L. Sm.—Thallus reddish-brown, thin, continuous, minutely cracked-areolate, suborbicular and determinate. Perithecia reddish-brown, sessile, hemispherical, becoming widely depressed round the ostiole; perithecial wall entire, reddish-brown above, paler below; paraphyses slender, thread-like, sometimes branched; spores ellipsoid, colourless, 0,017–20 mm. long, 0,009–010 mm. thick, or sometimes rather larger.—*Verrucaria thelostoma* Ach. ex Harrim. in Winch Bot. Guide ii. p. 44 (1807); Mudd Man. p. 293; Leight. Lich. Fl. p. 421; ed. 3, p. 452. *Lichen thelostomus* Sm. Engl. Bot. t. 2153 (1810). *Pyrenula umbonata* Ach. Lich. Univ. p. 316 (1810); S. F. Gray Nat. Arr. i. p. 493. *Segestria thelostoma* Fr. Lich. Eur. p. 429

(1831). *Segestrella thelostoma* Leight. Angioc. Lich. p. 34, t. 15, f. 2 (1851). *Lecanora thelostoma* Hook. in Sm. Engl. Fl. v. p. 189 (1833).

Distinguished by the wide depression round the scarcely visible ostiole, hence the resemblance to a Lecanorine apothecium,

Hab. On whinstone rocks.—*B. M.* Egglestone, Durham.

109. **GONGYLIA** Koerb. Syst. Lich. Germ. p. 351 (1855). (Pl. 45.)

Thallus crustaceous, not corticated. Algal cells *Pleurococcus*. Perithecia almost sessile, soft in texture, bright- or dark-coloured with a poriform ostiole; paraphyses slender, free; asci 4–8 spored; spores acicular, straight or somewhat bent, colourless, multiseptate.

A small genus, with representatives in North and Central Europe. The ostiole is very distinct, and tends to widen out at maturity, causing the perithecia to become almost disciform.

1. **G. viridis** A. L. Sm.—Thallus bright-green when fresh, thin, spreading. Perithecia numerous, shining-black when moist, globose, slightly immersed at the base, the ostiole very distinct, becoming wider; perithecial wall soft, black, rather uneven on the exterior, dimidiate, the inner wall dark blue-green; asci elongate-clavate, bent at the base, about 0,140 mm. long, 0,010–12 mm. thick; paraphyses longer than the asci, numerous, thread-like; spores narrowly fusiform acicular, somewhat abruptly narrower upwards or blunt, gradually tapering towards the base, colourless, multi-guttulate becoming multi-septate, 0,060–65 mm. long, 0,002–3 mm. thick.

The thallus follows the inequalities of the soil, and thus shows a somewhat granular surface; it is nearly allied to *G. sabuletorum*, a species found in Central Europe, but differs in the thallus and the much longer spores.

Hab.—On sandy soil by the side of a path.—*B. M.* Near Horsley, Surrey (the only locality).

110. **MICROGLÆNA** Koerb. Syst. Lich. Germ. p. 388 (1855); emend. Lönnroth in Flora xli. p. 632 (1858). *Thelenella* Nyl. in Maine et Loire Mém. Soc. Acad. iv. p. 62 (1858); see also Part i. p. 15. (Pl. 46.)

Thallus crustaceous, non-corticated. Algal cells *Pleurococcus*. Perithecia simple, immersed or almost free, globose or conical: paraphyses persistent, branched; asci 2–8-spored; spores ellipsoid, muriform, colourless or brownish.

1. **M. modesta** A. L. Sm.—Thallus whitish, thin, continuous or somewhat cracked and unequal. Perithecia embedded in small protuberances of the thallus, subglobose; perithecial wall soft and colourless at the base, brownish upwards to dark-brown

round the ostiole; paraphyses slender, distinct; asci elongate-clavate, 4–8-spored; spores ellipsoid, colourless, muriform, 0,019–38 mm. long, 0,011–18 mm. thick; spermogones with slender bent spermatia, 0,018–32 mm. long, 0,001 mm. thick.—*Verrucaria modesta* Nyl. in Bot. Not. 1853, p. 164; Leight. Lich. Fl. ed. 3, p. 492. *V. Carrollii* Nyl. ex Cromb. Lich. Brit. p. 119 (1870); Leight. Lich. Fl. p. 455; ed. 3, p. 487. *Sphæromphale Carrollii* Mudd Man. p. 283, t. 5, fig. 115 (1861).

Hab. On trees.—*Distr.* Rare in S.W. England and S. Ireland.—*B. M.* Barnsley Park, Gloucestershire; Rostellan, Cork.

2. **M. isidioides** A. L. Sm.—Thallus yellowish-brown, smooth, crustaceous, rather thick, areolate, the areolæ crowded, convex. Perithecia immersed in the areolæ, minute; perithecial wall brownish below, darker upwards, dark-brown towards the ostiole; paraphyses slender, persistent, conglutinate; spores 8 in the ascus (or fewer), ellipsoid-fusiform, colourless, then becoming brown, muriform, rather large, 0,030–46 mm. long, 0,012–16 mm. thick.—*Verrucaria isidioides* Borr. in Engl. Bot. Suppl. t. 2622, fig. 1 (1830); Carroll in Journ. Bot. iv. p. 25 (1866); Cromb. Lich. Brit. p. 117; Leight. Lich. Fl. p. 454; ed. 3, p. 486. *Pertusaria isidioides* Hook. in Sm. Engl. Fl. v. p. 160 (1833). *Porina isidioides* Tayl. in Mackay Fl. Hib. ii. p. 102 (1836). *Endocarpon isidioides* Leight. Angioc. Lich. p. 20, t. 6, fig. 4 (1851). *Dermatocarpon isidioides* Mudd Man. p. 270 (1861).

Hab. On rocks.—*B. M.* Glengariff near Bantry, Cork (the only locality).

3. **M. corrosa** Arn. in Flora lxviii. p. 155 (1885).—Thallus whitish or dirty-white, warted or granular and dispersed or obsolete. Perithecia minute, black, embedded in the swollen thalline warts (when present), the upper part protuding; perithecial wall dimidiate; paraphyses distinct, slender, loosely coherent; asci subcylindrical; spores 8 in the ascus, ellipsoid-fusiform, colourless, becoming muriform, 0,018–22 mm. long, 0,007–011 mm. thick.—*Limboria corrosa* Koerb. Syst. Lich. Germ. p. 376 (1855).

Var. **nericiensis** A. L. Sm.—Thallus and perithecia more developed and larger than in the species, internally similar.—*Microglæna nericiensis* Hellb. Nerikes Lafflora, p. 123 (1871).

The species has not been recorded in Britain. Both the specimens were collected by H. B. Holl, and called by him *Verrucaria dispersa*. The thallus is broken up into the small scattered warts that form the bases of the perithecia; the spores are at first simple, then finally septate and muriform.

Hab. On rocks in alpine regions.—*Distr.* Rare in N. Wales and the Scottish Grampians.—*B. M.* Cader Idris, Merioneth; Ben Lawers, Perthshire.

4. **M. Larbalestierii** A. L. Sm.—Thallus thin, brownish, mucilaginous, cracked, wrinkled and scattered when dry. Perithecia immersed in the thallus, conical, the ostiole protruding; perithecial wall colourless at the base; paraphyses slender, numerous; asci large, oblong-cylindrical, 8-spored; spores oblong-fusiform, colourless, muriform, with many transverse septa and one or more longitudinal divisions, about 0,050–55 mm. long, 0,010 mm. thick.

Differs from other species of the genus in the habitat and structure of the thallus and in the larger subfusiform spores which taper to somewhat blunt ends. Collected by C. Larbalestier.

Hab. On rocks in a stream.—*B. M.* Twelve Pins, Connemara, Galway.

5. **M. Holliana** A. L. Sm.—Thallus scanty, whitish, granular or none. Perithecia dark-brown when dry, clear brown when moist, scattered or crowded, sometimes two or more cohering, conical, semi-immersed; perithecial wall colourless below, becoming a clear brown upwards; paraphyses slender, rather scanty, persistent; asci elongate-oblong, 8-spored; spores large, ellipsoid-fusiform, sometimes slightly constricted in the middle, colourless, muriform, with small cells, 0,050–60 mm. long, 0,015–17 mm. thick.

Differs from *M. muscicola* Lönnr. in the semi-parasitic habit, the colour of the perithecia, and in 8-spored asci. Collected by H. B. Holl.

Hab. On the ground on thallus of *Cladonia*, mosses, &c.—*B. M.* Dolgelley, Merioneth (the only locality).

111. **STAUROTHELE** Norm. in Nyt. Mag. Naturv. vii. p. 240 (1852); emend. Th. Fr. Lich. Arct. p. 263 (1860) & in K. Svensk. Vetensk. Soc. Nov. Act. 1877, 8, p. 3.—*Sphæromphale* Reichenb. Consp. Reg. Veg. p. 20 (1828) pro parte; Mudd Man. p. 281 pro parte. (Pl. 47.)

Thallus variously crustaceous, not corticated, sometimes developed within the substratum. Algal cells *Pleurococcus*. Perithecia simple, superficial or immersed in the thallus with poriform ostioles, and with hymenial gonidia (regal cells); paraphyses mucilaginous, disappearing; asci broadly clavate, 1–8-spored; spores large, ellipsoid, muriform, colourless or dark-coloured.

Differs from the preceding genus in the presence of hymenial gonidia, which are usually small, roundish, cuboid or slightly elongate, and occur in loose lines or masses between the asci. They are ejected from the perithecium along with the spores.

Spores colourless.

1. **St. hymenogonia** A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, p. 57 (1903).—Thallus whitish or pale-grey or brownish, thin, tartareous and somewhat powdery or evanescent. Perithecia

moderate in size, semi-immersed, soft in texture and somewhat scabrid, prominent, convex; perithecial wall entire; paraphyses none; spores 8 in the ascus, linear-oblong, colourless, at first 1-septate and then muriform, 0,018–34 mm. long, 0,011–17 mm. thick; hymenial gelatine wine-red with iodine.—*Verrucaria muralis* Borr. in Engl. Bot. Suppl. t. 2647, fig. 2 (1830)? Leight. Angioc. Lich. p. 46, t. 20, fig. 1 (1851) (non Ach.). *V. hymenogonia* Nyl. in Act. Soc. Linn Bord. sér. 3, i. p. 430 (1856); Cromb. Lich. Brit. p. 115; Leight. Lich. Fl. p. 460; ed. 3, p. 491. *Sphæromphale hymenogonia* Mudd Man. p. 282 (1861).

Exsicc. Larb. Lich. Hb. n. 199.

Easily confused with *Verrucaria muralis*, as thallus and substratum are very similar, the perithecia, however, are rather larger, and the two are readily distinguished by internal characters.

Hab. On calcareous or arenaceous rocks, and mortar, &c.—*Distr.* Very rare throughout the British Isles.—*B. M.* Mount Edgcumbe, Cornwall; Downs, Sussex; Hyde and Cirencester, Gloucester; Newmarket Heath, Cambridge; Ben Lawers, Perthshire; Glanmire, Cork.

Spores brown, 1 or 2 in the ascus.

2. **St. umbrinum** A. L. Sm.—Thallus brownish or dark-brown, thin, smooth, unequally cracked-areolate. Perithecia innate in a swelling of the thallus, the ostioles projecting; perithecial wall dimidiate; paraphyses disappearing; asci broadly clavate, 2-spored; spores oblong or obovate-oblong, muriform, dark-brown, large, 0,045–50 mm. long, 0,018–20 mm. thick.—*Verrucaria lithina* Ach. Meth. Suppl. p. 18 (1803)? *V. umbrina* Fr. Lich. Eur. p. 441 (1831) (non Ach. nec Wahlenb. Fl. Suec. p. 871 fide Th. Fr. Lich. Arct. p. 270); Cromb. Lich. Brit. p. 109; Leight. Lich. Fl. p. 453; ed. 3, p. 484. *V. fissa* Tayl. in Mackay Fl. Hib. ii. p. 95 (1836). *Endocarpon lithinum* Leight. Angioc. Lich. p. 19, t. 6, fig. 2 (1851). *E. fissum* Leight. tom. cit. p. 20, t. 6, fig. 3. *Sphæromphale umbrina* Mudd Man. p. 281 (1861).

Exsicc. Leight. n. 98 pro parte.

Hab. On rocks in or near rivers and lakes.—*Distr.* Rare in upland regions.—*B. M.* Llandyssil, Cardiganshire; Llangollen, Denbighshire; Sunday's Well, Cork; Ardglass, Down.

3. **St. clopima** Th. Fr. Lich. Arct. p. 263 (1860).—Thallus brownish, thickish, tartareous, warted-areolate, the areolæ somewhat tumid and rounded. Perithecia immersed in the thallus, with a depressed ostiole; perithecial wall dimidiate, black; paraphyses none; spores 1 or 2 in the ascus, oblong, colourless, becoming dark-brown, muriform, large, 0,032–53 mm. long, 0,012–23 mm. thick; hymenial gelatine reddish-blue with iodine.—*Verrucaria clopima* Wahlenb. in Ach. Meth. Suppl. p. 19

(1803); Carroll in Journ. Bot. iii. p. 292 (1865)? Leight. Lich. Fl. ed. 3, p. 485.

Differs from the preceding in the form and development of the thallus. A specimen in the British Museum from Dawros River, collected by Larbalestier and recorded by him under this species, is *Verrucaria viridula*.

Hab. On rocks in or near rivers.—*Distr.* Rare in W. Ireland, Dawros River, Connemara, Galway.

Spores brown, 4–8 in the ascus.

4. **St. rupifraga** Arn. in Verh. K.K. Zool.-Bot. Ges. xxx. p. 149 (1880).—Thallus dark-bluish-grey or whitish, or smoky-brown, tartareous-farinose, effuse, thin, sometimes evanescent Perithecia small, globose, immersed in the rock or emergent, leaving pits, somewhat plane above, the ostiole a minute pore; perithecial wall entire; paraphyses disappearing; spores 4–8 in the ascus, ovoid-oblong, becoming dark-reddish-brown, muriform, 0,036–55 mm. long, 0,012–20 mm. thick; hymenial gelatine wine-red with iodine.—*Sagedia calcarea* Deakin in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 39, t. 4, fig. 12 (1854)? *Polyblastia rupifraga* Massal. Symm. Lich. p. 100 (1855). *Verrucaria umbrina* var. *calcarea* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 426 (1856); Cromb. Lich. Brit. p. 109. *V. rupifraga* Nyl. ex Cromb. Lich. Brit. p. 109 (1870); Leight. Lich. Fl. p. 456; ed. 3, p. 488. *V. terebrata* Leight. Lich. Fl. p. 456; ed. 3, p. 488. *Sphæromphale terebrata* Mudd Man. p. 281 (1861).

Sometimes the perithecia are so immersed as to be visible merely as minute black points in the stone. The spores are divided into small cells without any definite transverse septa.

Hab. On calcareous rocks.—*Distr.* Rare in W. England, N. Scotland and W. Ireland.—*B. M.* Sapperton, Gloucestershire; Craig Guie. Braemar. Aberdeenshire; Kylemore, Connemara, Galway.

PYRENULACEÆ.

Thallus crustaceous, superficial or developed within the substratum, not corticated. Algal cells *Trentepohlia*. Perithecia simple, globose or semi-globose, more or less immersed, opening by a pore at the apex (*ostiole*). Spermogones small, globose or ovoid, with simple or sparingly branched sterigmata and spermatia produced apically.

Distinguished by the yellowish filamentous gonidia (*Trentepohlia*), and also by the almost constantly persistent paraphyses. There are eight genera represented in the British Islands:—

Perithecia scattered.
Paraphyses branched, entangled or wanting.
Asci cylindrical, spores uniseriate.
Spores 1-septate ..... **112. Acrocordia.**

Asci clavate or ovate, spores more or less massed.
Spores colourless.
Spores elongate - fusiform, 1–5-septate ..... 113. **Arthopyrenia.**
Spores elongate - acicular, multi-septate ..... 114. **Leptorhaphis.**
Spores brown.
Spores 1–5-septate ..... 115. **Microthelia.**
Paraphyses unbranched, distinct.
Spores colourless 1–5-septate.
8 in the ascus ..... 116. **Porina.**
Many in the ascus..... 117. **Thelopsis.**
Spores brown.
Spores 1–5-septate with short cells 118. **Pyrenula.**
Perithecia often united.
Spores brown, muriform ..... 119. **Anthracothecium.**

112. **ACROCORDIA** Massal. Gen. Lich. p. 17 (1854). (Pl. 47.)
Thallus crustaceous. Perithecia simple, globose or semi-globose and somewhat conical, black, semi-immersed; paraphyses persistent, slender, branched and entangled; asci cylindrical-oblong, 8-spored; spores uniseriate in the ascus, ellipsoid, 1-septate, colourless. Spermogones small, globose, with rod-like spermatia.

Distinguished by the elongate narrow asci with the spores in a straight or oblique row.

1. **A. gemmata** Koerb. Syst. Lich. Germ. p. 356 (1855).—Thallus white or greyish-white, thin, nearly smooth or somewhat pulverulent, continuous or sometimes cracked, effuse or limited by a dark hypothallus. Perithecia black, large, prominent, hemispherical, immersed at the spreading base, usually with a papillate ostiole; perithecial wall dimidiate with an inner thin brown entire layer; paraphyses long, slender; spores broadly oblong, 1-septate, colourless, 0,015–29 mm. long, 0,007–0,013 mm. thick. —*Lichen gemmatus* Ach. Lich. Suec. Prodr. p. 17 (1798). *Verrucaria gemmata* Ach. Meth. p. 120, t. 3, fig. 1 (1803); Borr. in Engl. Bot. Suppl. t. 2617, fig. 2; Hook. in Sm. Engl. Fl. v. p. 150; Tayl. in Mackay Fl. Hib. ii. p. 89; Leight. Angioc. Lich. p. 43, t. 18, figs. 4 & 5 & Lich. Fl. p. 430; ed. 3, p. 462; Cromb. Lich. Brit. p. 118. *Lejophlea gemmata* S. F. Gray Nat. Arr. i. p. 496 (1821). *Thelidium gemmatum* Mudd Man. p. 297 (1861).

Exsicc. Carroll Lich. Hib. n. 33; Larb. Lich. Hb. n. 196; Mudd n. 285; Leight. n. 136.

Hab.—On trunks of trees.—*Distr.* Common throughout the Channel Islands, England, Wales, and S. and S.W. Ireland; rare in Scotland.—*B. M.* Trinity, Jersey; Lanhydrock Park, Cornwall; Torquay, Devon; near Brighton, Erringham, Wiston and Woodmancote, Sussex; near Lyndhurst, New Forest, Hants; Batheaston, Somerset; near Cirencester, Gloucestershire; Thorndon Hall, Wal-

thamstow and Epping Forest, Essex; Haughmond Hill, Church Stretton and near Shrewsbury, Shropshire; Newton, near Worcester; Dolgelly, Merioneth; Llandudno, Carnarvonshire; King's Lynn, Norfolk; near Ayton, Cleveland, Yorkshire; Aberfeldy, Perthshire; Lochaber, Invernessshire; Carrigaloe, Summerstown, Castlemartyr and Ballyedmond, Cork; near Derrycurrihy, Dinish Island and Killarney, Kerry; Castleconnel and Adare, Limerick; Dromoland, Clare.

2. **A. biformis** Oliv. Exp. Syst. ii. 2, p. 246 (1901).—Thallus effuse, white or whitish-grey, thin, somewhat pulverulent, sometimes slightly cracked or wrinkled. Perithecia numerous, small, semi-immersed, prominent, the ostiole at first a minute pore becoming widened and torn; perithecial wall incurved, thin under the base; paraphyses slender, numerous; spores obliquely uniseriate, sometimes almost biseriate, ellipsoid, 1-septate, colourless, 0,012–16 mm. long, 0,005–7 mm. thick.—*Verrucaria biformis* Borr. in Engl. Bot. Suppl. n. 2617, fig. 1 (1829); Hook. in Sm. Engl. Fl. v. p. 150; Tayl. in Mackay Fl. Hib. ii. p. 89; Leight. Angioc. Lich. p. 37, t. 16, fig. 2 & Lich. Fl. p. 439; ed. 3, p. 468; Cromb. Lich. Brit. p. 119. *V. byssacea* Tayl. *l. c.* (non Ach.) fide Leight. *Thelidium biformis* Mudd Man. p. 297 (1861).

Exsicc. Leight. n. 100; Mudd n. 286.

Nearly allied to the preceding, but differing in the more numerous smaller apothecia and smaller spores, which are often unequally 2-celled and tapering towards the base. The perithecial wall is described by Leighton and Mudd as entire, but although black and thick over the upper surface, it is brown below, the perithecium being seated on the substratum.

Hab. On trunks of trees.—*Distr.* Somewhat common throughout England, Wales and Ireland, not reported from Scotland.—*B. M.* Torquay, Devon; St. Leonard's Forest, Woolsenbury, Clayton and Poynings, Sussex; Hadleigh Woods, Springfield, Hatfield Peverel and Walthamstow, Essex; Shere, Surrey; Gopsall, Leicestershire; Yoxall, Staffordshire; Shelton Rough near Shrewsbury, Shropshire; Bettws-y-Coed, Carnarvonshire; Ayton, Cleveland, Yorkshire; Tullagreen, Cork; Ardtully and Dromore, near Dunkerrow and near Killarney, Kerry; Clonmel, Tipperary; Adare and Castleconnel, Limerick; Renvyle, Connemara, Galway.

Var. **conformis** A. L. Sm.—Similar to the species, but differing in the more distinctly dimidiate perithecial wall, and occasionally in the biguttulate contents of the spore-cells.—*Verruccia conformis* Nyl. in Flora xlvii. p. 357 (1864); Carroll in Journ. Bot. vi. p. 101 (1868); Cromb. Lich. Brit. p. 119; Leight. Lich. Fl. p. 430; ed. 3, p. 463.

Exsicc. Larb. Lich. Hb. (without number).

Hab. On bark of trees.—*Distr.* Rare in Channel Islands, Wales and S. and W. Ireland.—*B. M.* Jersey; Ballynahinch, Galway.

3. **A. epipolæa** A. L. Sm.—Thallus greyish or whitish, sometimes tinged with rose, tartareous or powdery, very thin,

sometimes obsolete. Perithecia dull-brownish-black, sometimes partly pruinose, rather large but mixed with smaller, conical or hemispherical, slightly immersed, spreading at the base, the ostiole papillate, shining; perithecial wall dimidiate; paraphyses numerous, slender; asci cylindrical; spores oblong or broadly ellipsoid, 1-septate, 0,015–23 mm. long, 0,007–9 mm. thick.—*Verrucaria epipolæa* Borr. in Engl. Bot. Suppl. t. 2647, fig. 3 (1830) (non Ach.); Hook. in Sm. Engl. Fl. v. p. 154; Tayl. in Mackay Fl. Hib. ii. p. 92; Leight. Angioc. Lich. p. 61, t. 26, fig. 2. *V. conoidea* Fr. Lich. Eur. p. 432 (1831); Cromb. Lich. Brit. p. 118; Leight. Lich. Fl. p. 430; ed. 3, p. 460. *Thelidium conoideum* Mudd Man. p. 296 (1861).

Exsicc. Leight. n. 31; Mudd n. 286; Larb. Lich. Hb. n. 118.

Hab. On calcareous rocks.—*Distr.* Frequent throughout England, Wales and Ireland, rare in Scotland.—*B. M.* Shanklin, I. of Wight; Torquay, Devon; Hyde, Gloucestershire; Leigh Woods, Clifton, Somerset; Llanymynech and Llanorda, Oswestry, Shropshire; Beddgelert, Merioneth; Great Orme's Head, Carnarvonshire; Youlgreave, Derbyshire; Ingleby, Cleveland, Yorkshire; near Cork; Derryquin, Kerry; Ballinakill, Connemara, Galway.

4. **A. Salweii** A. L. Sm.—Thallus white or greyish, thin, tartareous, powdery or nearly obsolete. Perithecia black, rather large, prominent almost globose, slightly immersed or almost entirely sessile, somewhat wrinkled, the ostiole poriform; perithecial wall thick, black, entire; paraphyses numerous, slender, distinct; asci cylindrical; spores oblong or broadly ellipsoid, 1-septate, 0,021–23 mm. long, 0,008–011 mm. thick. *Verrucaria gemmata* subsp. *Salweii* Leight. ex Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 435 (1856). *V. Salweii* Leight. ex Cromb. Lich. Brit. p. 118 (1870); Leight. Lich. Fl. p. 439; ed. 3, p. 469. *Thelidium Salweii* Mudd Man. p. 296 (1861).

Closely allied to the preceding, but differing in the entire perithecial wall and the non-papillate ostiole.

Hab. On calcareous or arenaceous rocks and mortar of walls.—*Distr.* Rare in S. and W. England and in S. and W. Ireland.—*B. M.* Near Hurstpierpoint, Sheffield Park and Danny, Sussex; Oswestry, Shropshire; Ingleby, Cleveland, Yorkshire; Glanmire, Cork.

113. **ARTHOPYRENIA** Massal. Ric. Lich. p. 165 (1852) & emend. Gen. Lich. p. 16 (1854); Mull.-Arg. in Engl. Bot. Jahrb. vi. p. 376 (1885) (excl. *Acrocordia*). *Lejophlea* S. F. Gray Nat. Arr. i. p. 495 (1821) pro parte. *Verrucaria* subg. *Lejophlea* Ach. Lich. Univ. p. 274 (1810) pro parte. (Pl. 49.)

Thallus crustaceous, superficial or developed within the substratum. Perithecia simple, always dark-coloured, superficial or semi-immersed, globose or semi-globose; paraphyses persistent, branched and entangled, or sometimes mucilaginous and dis-

appearing; asci somewhat elongate-ovate, 2–8-spored; spores ellipsoid or elongate, more or less constricted in the middle, 1- or more-septate, grouped in the ascus, colourless. Spermogones small, globose or ovoid with simple sterigmata and rod-like spermatia.

Growing on trees; thallus usually light-coloured; spores 1-*septate.*

1. **A. epidermidis** Mudd Man. p. 303 (1861) (excl. vars. except var. *atomaria*) (non Massal.).—Thallus developed below the bark, forming greyish or brownish spots or little visible, smooth, effuse or determinate. Perithecia small, black, hemispherical, semi-immersed, becoming more or less prominent and shining, sometimes slightly spreading at the base; perithecial wall dimidiate; paraphyses present, more or less branched, entangled or disappearing; asci ovate-elongate; spores oblong or clavate-oblong, colourless, 1-septate, sometimes slightly constricted, the cells almost equal in length, sometimes with a mucilaginous coat (halonate), 0,015–24 mm. long, 0,005–7 mm. thick.—*A. nitescens* Mudd *l. c.*; *Verrucaria epidermidis* Fr. Lich. Eur. p. 447 (1831) pro parte (non Ach. fide Wainio in Helsingf. Faun. & Fl. Fenn. Meddel. x. p. 187 (1883)); Grev. Fl. Edin. p. 353? Hook. in Sm. Engl. Fl. v. p. 149 pro parte; Tayl. in Mackay Fl. Hib. ii. p. 88 pro parte; Leight. Angioc. Lich. p. 40, t. 17, fig. 3 (excl. var. *analepta*) & Lich. Fl. p. 431; ed. 3, p. 463 (excl. vars.); Cromb. Lich. Brit. p. 119 (excl. vars.). *V. nitescens* Salwey in Trans. Nat. Hist. Soc. Penzance, 1853, p. 140 (e descript.); Leight. Lich. Fl. p. 434; ed. 3, p. 467. *V. epidermidis* var. *nitescens* Cromb. *l. c.*

Exsicc. Carroll Lich. Hib. n. 31; Bohl. n. 63.

Confused with *Verrucaria epidermidis* Ach. (*Leptorhaphis*), which is wholly confined to birch bark and has different spores. The perithecia are always small and round in outline with the base immersed in the epidermis of the host.

Hab. On the bark of birch and other trees.—*Distr.* Somewhat common in S. and N. England, and in S. and W. Ireland; Scotland?—*B. M.* Bodmin, Cornwall; Torquay, Devon; Malley Wood, New Forest, Hants; Ulting, Sussex; Shere, Surrey; Cowcombe Wood, Kemble near Cirencester and Chalford, Gloucestershire; Bath, Somerset; Capel Arthog, Merioneth; Builth, Brecknockshire; Trefriw and Bettws-y-Coed, Carnarvonshire; near Ayton, Cleveland, Yorkshire; Riverstown, Castlemartyr, Carrigaloe, Glanmire and White Point Harbour, Cork; Torc Mt., Croghan Mt. and Cromaglown, Killarney, Loch Inchiquin and Glencar, Kerry; Clonmel, Tipperary.

Var. **lactea** Mudd Man. p. 304 (1861) pro parte.—Thallus white or whitish, determinate, sometimes surrounded by a dark line. Perithecia moderate in size, spreading at the base, shining-black or partly covered by the thallus, otherwise as in the species. —*Verrucaria punctiformis* var. *lactea* Schær. Enum. p. 220 (1850)

(non *V. stigmatella* var. *lactea* Ach. fide Muell.-Arg. in Flora lxviii. p. 259 (1885)).

Exsicc. Mudd n. 294.

The perithecia are slightly more spreading at the base than in the species, in this character approaching *A. analepta*.

Hab. On the bark of trees, chiefly sycamore.—*Distr.* Rare in N. England.—*B. M.* Kildale, Cleveland, Yorkshire.

2. **A. punctiformis** Arn. in Flora lxviii. p. 160 (1885).—Thallus developed below the bark, forming dark patches, or the bark remaining unchanged. Perithecia minute, black, shining, convex or somewhat conical, semi-immersed or becoming almost superficial; perithecial wall dimidiate; asci small, pyriform or usually angular at the base with the stalk-cell at one side; usually 0,040–60 mm. long, 0,014 mm. thick, sometimes more swollen; paraphyses indistinct, mostly obsolete; spores oblong or oblong-ovoid, 1-septate, the cells almost equal, 0,014–17 mm. long, 0,003–5 mm. thick.—*A. epidermidis* var. *punctiformis* Mudd Man. p. 305 (1861); var. *atomaria* Mudd *l. c.* *Verrucaria punctiformis* Pers. in Ust. Ann. Bot. xi. p. 19 (1794) fide Arn. *l. c.*; Hook. in Sm. Engl. Fl. v. p. 150; Tayl. in Mackay Fl. Hib. ii. p. 88; Leight. Angioc. Lich. p. 41, t. 17, fig. 5 & Lich. Fl. p. 433; ed. 3, p. 466 (excl. ff. *tremulæ* and *elongatula*). *V. epidermidis* var. *punctiformis* Nyl. Lich. Scand. p. 281 (1861); Cromb. Lich. Brit. p. 19. *Lichen punctiformis* Ach. Lich. Suec. Prodr. p. 18 (1798); Engl. Bot. t. 2412. *L. atomarius* Ach. tom. cit. p. 16? *Lejophlea punctiformis* S. F. Gray Nat. Arr. i. p. 496 (1821).

Exsicc. Mudd n. 298; Leight. nos. 288, 344.

Differs from the preceding species in the smaller size of all the parts and in the obsolete paraphyses. Leighton includes in f. *diminutula* (var. *deminutula* Nyl. in Flora li. p. 164 (1868)) forms with minute perithecia and larger spores, 0,016–22 mm. long, 0,003–4 mm. thick, but the specimen of f. *diminutula* in the herbarium, collected at the same time and place as Leighton's form (Torc Mt., Killarney), does not differ from the species, the spores are somewhat elongate and measure 0,017 mm. long, 0,003–4 mm. thick.

Hab. On the bark of various trees.—*Distr.* Not uncommon throughout the British Isles.—*B. M.* Hurstpierpoint, Sussex; Chedworth and Chalford, Gloucestershire; Bath, Somerset; Hay Forest, Herefordshire; Comberton Woods, Cambridgeshire; Hoggart's Wood, Ingleby, and Cliffrigg, Cleveland, Yorkshire; Barcaldine, Lorne, Argyll; White Point, Cork; Croghan, Cromaglown, Dinish, Torc Mt. and Derrycurrihy, Killarney and Glencar, Kerry; Dublin.

3. **A. pyrenastrella** Oliv. Exp. Syst. Lich. ii. p. 266 (1900).—Thallus greyish or brownish, effuse, often indistinct. Perithecia black, minute, semi-immersed, roundish, solitary or in small groups confluent at the base; perithecial wall dimidiate; paraphyses indistinct, breaking up and disappearing; asci cylindrical

or subventricose; spores colourless, cylindrical, clavate, 1-septate, the upper cell rather thicker, the lower cell longer, 0,015–25 mm. long, 0,004–6 mm. thick.—*Verrucaria epidermidis* var. *pyrenastrella* Nyl. in Maine et Loire Mém. Soc. Acad. iv. p. 59 (1858). *V. punctiformis* f. *tremulæ* Leight. Lich. Fl. p. 434 (1871); ed. 3, p. 466, e descript. (*V. stigmatella* var. *tremulæ* Ach. Meth. p. 117 (1803)?). *V. submiserrima* Nyl. in Flora lx. p. 231 (1877), e descript.; Leight. Lich. Fl. ed. 3, p. 472.

Allied to *A. punctiformis*, but with smaller congregate perithecia and larger spores.

Hab. On the bark of trees.—*Distr.* Rare in S. England, W. Scotland and S.W. Ireland.—*B. M.* Sheffield Park and Nutley, Sussex; Barcaldine, Lorne, Argyll; Croghan, Killarney, Kerry.

4. **A. cinereopruinosa** Koerb. Syst. Lich. Germ. p. 368 (1855).—Thallus greyish- or yellowish-white, effuse, very thin. Perithecia hemispherical, more or less minute, innate at first and thinly covered by the thallus which gives them a pruinose appearance, sometimes emergent and shining black; perithecial wall dimidiate; asci cylindrical-clavate, rarely obovate; paraphyses slender, often septate, numerous or scanty, sometimes breaking up; spores colourless, equally 1-septate, constricted in the middle, with usually a slighter constriction in each cell, 015–22 mm. long, 005–7 mm. thick.—*A. epidermidis* var. *cinereopruinosa* Mudd Man. p. 305 (1861) (incl. subvar. *galactites*) (*Verrucaria galactites* DC. Fl. Franc. ii. p. 315 (1805)?). *Verrucaria cinereopruinosa* Schær. Spicil. p. 343 (1833). *V. epidermidis* var. *cinereopruinosa* Garov. Tent. p. 84, t. 5, fig. 5 (1865); Leight. Lich. Fl. p. 432; ed. 3, p. 464.

Exsicc. Leight. n. 197; Mudd n. 297; Carroll Lich. Hib. n. 30; Larb. Lich. Hb. n. 279 (as *Verrucaria fallax*).

Differs from *A. epidermidis* chiefly in the immersed perithecia, but also in the more elongate asci and more distinct paraphyses. The spores often have a distinct slight constriction in each cell.

Hab. On bark of trees.—*Distr.* Somewhat rare in S. and N. England and in S. Ireland.—*B. M.* Torquay, Devon; near Crawley, Sussex; near Guiting and near Cirencester, Gloucestershire; Ingleby and Ayton, Cleveland, Yorkshire; Castle Bernard Park, Bandon, Little Island and near Carrigaline, Cork; Kenmare, Kerry; near Clifden and Renvyle Wood, Connemara, Galway.

Form **Hederæ** Arn. in Flora lxviii. p. 160 (1885).—Differs from the species in the somewhat more exposed and larger perithecia and in the more elongate asci, the spores show occasionally a second or third septum.—*Pyrenula punctiformis* var. *cinereopruinosa* form *Hederæ* Hepp Flecht. Eur. n. 105 (1853).

Hab. On ivy branches.—*Distr.* Rare in W. Ireland.—*B. M.* Killaloe, Clare.

5. **A. analepta** Massal. Ric. Lich. p. 165 (1852) emend. Koerb. Parerg. p. 389 (1865).—Thallus effuse, developed under the bark, which it colours light or dark-brown. Perithecia hemispherical, semi-immersed, spreading at the base, moderate in size, often ringed by a darker circle of the thallus; perithecial wall dimidiate; paraphyses rather confused and entangled; asci clavate-oblong; spores colourless, ellipsoid or oblong, 1-septate, slightly constricted in the middle, usually 0,022 mm. long, 0,007 mm. thick, but sometimes longer or narrower.—*A. epidermidis* var. *analepta* Mudd Man. p. 304 (1861) (incl. subvars. *Mespyli*, *Coryli* and *acerini*). *Lichen analeptus* Ach. Lich. Suec. Prodr. p. 15 (1718)? *Lejophlea analepta* S. F. Gray Nat. Arr. i. p. 496 (1823). *Verrucaria epidermidis* var. *analepta* Hook. in Sm. Engl. Fl. v. p. 149 (1833)? Tayl. in Mackay Fl. Hib. ii. p. 88? Leight. Angioc. p. 40, t. 17, fig. 4 & Lich. Fl. p. 432; ed. 3, p. 463; Cromb. Lich. Brit. p. 119.

Exsicc. Leight. n. 29; Mudd nos. 293, 296 (as *A. epidermidis* var. *punctiformis*).

Easily distinguished from the preceding three species by the larger spreading perithecia, and usually by the darker thallus. Arnold (Flora lxviii. p. 159 (1868)) quotes Leight. *Exsicc.* n. 29 as *A. fallax*, but the specimen in the British Museum is *A. analepta*.

Hab. On the smooth bark of trees.—*Distr.* Not uncommon in England, rare in S.W. Ireland.—*B. M.* Hadleigh Woods, Mark's Hall, Ulting and Hoe Street, Essex; Haughmond Hill, Shropshire; Llandyssil, Cardiganshire; Bettws-y-Coed, Carnarvonshire; Newton Wood and Hoggart's Wood, Ingleby, Ayton and Cliffrigg, Cleveland, Yorkshire; Cromaglown, Killarney.

6. **A. fallax** Arn. in Flora lxviii. p. 159 (1885).—Thallus effuse, developed under the bark which it colours light or dark-brown. Perithecia moderate in size, hemispherical, semi-immersed, spreading at the base, often ringed by a darker circle of the thallus; perithecial wall dimidiate; paraphyses distinct, few or numerous, free; asci clavate-oblong; spores colourless, ellipsoid or oblong, 1-septate, slightly constricted in the middle, the lower cell usually smaller, 0,016–22 mm. long, 0,007–9 mm. thick, spermogones with rod-like spermatia, 0,010 mm. long, 0,001 mm. thick.—*A. epidermidis* var. *fallax* Mudd Man. p. 303, t. 5, fig. 126 (1861). *Lichen analeptus* Sm. Engl. Bot. t. 1848 (1808). *Verrucaria epidermidis* var. *fallax* Nyl. in Bot. Not. 1852, p. 178; var. *analepta* f. *fallax* Cromb. Lich. Brit. p. 119 (1870); Leight. Lich. Fl. p. 432; ed. 3, p. 464. *V. analeptella* Nyl. in Flora lv. p. 363 (1872) e descript.; Leight. Lich. Fl. ed. 3, p. 464.

Exsicc. Bohl. n. 66; Mudd n. 292.

Characterized by the distinct paraphyses, but in form and appearance very similar to the preceding, of which it may be only a variety or growth form. *V. analeptella* has been included here, as Nylander says it differs from *V. analepta* only in the possession of distinct

paraphyses; there is no specimen of it at the British Museum. Nylander (*l. c.*) gives *Sagedia ænea* in Anzi Lich. Min. rar. n. 395 as a synonym, but that plant has been identified by him in MS. as *Verrucaria grisea*.

Hab. On the smooth bark of trees.—*Distr.* Common throughout England, rare in Scotland and S.W. Ireland.—*B. M.* Torquay, Devon; Pease Cottage Gate, New Timber Wood, Hayward's Heath and St. Leonard's Forest, Sussex; Writtle, Essex; Cradley, Herefordshire; Savernake, Wilts; Chedworth, Gloucestershire; near Malvern, Worcestershire; Nesscliff, Shropshire; Ayton, Ingleby and Hob Hole, Cleveland, Yorkshire; Bettws-y-Coed and Trefriw, Carnarvonshire; Morrone, Braemar, Aberdeenshire; near Macroom and Muckross, Cork; Croghan and Kenmare, Kerry.

7. **A. stigmatella** A. L. Sm. (non Massal.).—Thallus greyish or brownish, effuse, thin, smooth and shining. Perithecia black, small, varying in size, often a mere point, semi-immersed and hemispherical or more emergent and somewhat convex; perithecial wall dimidiate; paraphyses usually indistinct; asci, elongate-elliptical; spores colourless, elongate-oblong, usually tapering at one or both ends, often becoming brownish, large, 1-septate, 0,027–40 mm. long, 0,007–010 mm. thick.—*Lichen stigmatellus* Sm. Engl. Bot. t. 1891 (1808) (non Ach.). *Lejophlea stigmatella* S. F. Gray Nat. Arr. i. p. 496 (1823). *Verrucaria cinerea* Hook. in Sm. Engl. Fl. p. 149 (1833) (non Pers. in Ust. Ann. vii. p. 28, t. 3, fig. 6a (1794)); Tayl. in Mackay Fl. Hib. ii. p. 88; Leight. Angioc. Lich. p. 39, t. 17, fig. 2 & Lich. Fl. p. 433; ed. 3, p. 464. *V. antecellens* Nyl. in Flora xlix. p. 86 (1866); Carroll in Journ. Bot. v. p. 260 (1867); Cromb. Brit. Lich. p. 119; Leight. Lich. Fl. p. 435; ed. 3, p. 465 & in Grevillea i. p. 60, t. 4, fig. 2. *V. epidermidis* var. *cinerea* Mudd Man. p. 304 (1861); Cromb. Lich. Brit. p. 119.

Exsicc. Leight. n. 343; Mudd n. 295 (both specimens imperfectly developed); Carroll Lich. Hib. n. 32.

Easily recognized by the large 1-septate spores, and usually by the mixture of larger and smaller perithecia and spermogonia dotted over the thallus.

Hab. On the bark of trees, chiefly holly.—*Distr.* Not uncommon in S. England. Rare in N. England and Wales, common in S. and W. Ireland.—*B. M.* Withiel and St. Breock, Cornwall; Ivy Bridge, Devon; Lyndhurst, New Forest, Hants; Pease Pottage Gate, Tilgate and St. Leonard's Forest, Sussex; Shere, Surrey; Leckhampton, Gloucestershire; Dolgelly, Merioneth; Bettws-y-Coed, Carnarvonshire; Ingleby, Newton and Kildale, Cleveland, Yorkshire; Glenbower, Glanmire, Crosshaven, Castle Bernard and Castlemartyr, Cork; Croghan, Torc Mt., Cromaglown, Loch Inchiquin, Dinish, Killarney, Old Dromore and Glencar, Kerry; Loughcooter, Galway.

8. **A. analeptoides** A. L. Sm.—Thallus whitish-grey, thin, effuse. Perithecia black, moderate in size, hemispherical,

semi-immersed and slightly spreading at the base, or small, emergent and subglobose; perithecial wall dimidiate; paraphyses numerous, septate, lax or coherent; asci elongate-clavate; spores elongate, fusiform-clavate, 1-septate, the cells with several guttulæ and spuriously 3–5-septate, colourless or slightly tinged yellowish, 0,023–35 mm. long, 0,006–7 mm. thick.—*Verrucaria analeptoides* Nyl. in Flora l. p. 180 (1867) (non Bagl. & Carest.). *V. analeptiza* Nyl. in op. cit. lvi. p. 300 (1873); Leight. Lich. Fl. ed. 3, p. 464. *V. antecellens* var. *analeptoides* Cromb. Lich. Brit. p. 119 (1870); Leight. Lich. Fl. p. 435. *V. elongatula* Nyl. in Flora li. p. 164 (1868). *V. punctiformis* f. *elongatula* Leight. Lich. Fl. p. 434; ed. 3, p. 466; Cromb. Lich. Brit. p. 120.

Not to be confused with *A. submicans*, the spores of which are 4-guttulate but finally 3-septate. It differs from *A. stigmatella*, with which it has been associated, in the greyer more superficial thallus and in the narrower guttulate spores. Nylander gives the size of the spores at 0,036–50 mm. long, 0,007–010 mm. thick, but these measurements are not borne out by an examination of Carroll's specimen.

Hab. On bark of trees.—*Distr.* Rare in S.W. Ireland.—*B. M.* Dinish and Torc Mt., Killarney, Kerry; Loughcooter, Galway.

9. **A byssacea** A. L. Sm.—Thallus filmy, whitish, thin, effuse. Perithecia minute, black, globose, semi-immersed; perithecial wall dimidiate; paraphyses numerous, branched, free; asci elongate-clavate, about 0,070 mm. long, 0,017 mm. thick; spores 8 in the ascus, fusiform, 1-septate (?), colourless, 0,015 mm. long, 0,004 mm. thick. *Verrucaria byssacea* Tayl. in Mackay Fl. Hib. ii. p. 89 (1836) (non Ach. fide Leight. Angioc. Lich. p. 38).

Leighton suggests (*l. c.*) that Taylor's species is identical with *Acrocordia biformis*, but the minute perithecia and the structure of asci and spores are entirely distinct. There is only one small specimen in the herbarium of the British Museum collected by Dr. Taylor; the spores are somewhat imperfectly developed, but so far as can be determined they are 1-septate.

Hab. On barks of trees, oak and elm.—*B. M.* Presumably Kerry. (Ex Herb. Salwey.)

Growing on trees; thallus dark-coloured; spores 1*-septate.*

10. **A. Laburni** Sydow Flecht. Deutschl. p. 295 (1887).—Thallus thin, smooth, brown or brownish-black, forming dark spots on the bark. Perithecia minute, hemispherical, semi-immersed, black and shining; perithecial wall dimidiate; paraphyses indistinct, disappearing; asci rather swollen, narrower upwards; spores oblong-linear, 1-septate, scarcely constricted, the cells almost equal, sometimes with two or more guttulæ; 0,020–25 mm. long, 0,004–5 mm. thick; hymenial gelatine yellow with iodine.—*A. Fumago* Mudd Man. p. 302 (1861) (non Koerb. Syst.

Lich. Germ. p. 370 (1855)). *Verrucaria Laburni* Leight. Lich. Fl. p. 435 (1871); ed. 3, p. 465.

Exsicc. Leight. n. 254; Mudd n. 291.

Easily confused with *A. rhyponta;* it differs in the narrower, 2-celled spores.

Hab. On laburnum and other trees.—*Distr.* Rare throughout the British Isles.—*B. M.* Cirencester, Gloucestershire; Ayton, Cleveland, Yorkshire; Trefriw, Carnarvonshire; Aberfeldy, Perthshire.

11. **A. microspila** Koerb. Parerg. Lich. p. 392 (1865).—Thallus forming dull black filmy or roughish spots on the bark. Perithecia minute, black, prominent, hemispherical, slightly papillose above; perithecial wall entire with a thin wall under the base; spores colourless, linear-oblong, 1-septate, small, 0,013–17 mm. long, 0,003–5 mm. thick, or sometimes a little longer.—*A. rhyponta* Mudd Man. p. 303 (1861) (non Massal.). *Verrucaria rhyponta* Borr. in Engl. Bot. Suppl. n. 2597, fig. 2 (1829) (non Ach.); Hook. in Sm. Engl. Fl. v. p. 150 (excl. syn. Ach.); Tayl. in Mackay Fl. Hib. ii. p. 89: Leight. Angioc. Lich. p. 37, t. 16, fig. 1; var. *rhypontella* Nyl. in Flora l. p. 374 (1867); Cromb. *l. c.* *V. capnodes* Nyl. in Flora l. p. 330 (1867); Lindsay in Quart. Journ. Micros. Sci. ix. p. 351 (1869); Cromb. Lich. Brit. p. 120; Leight. Lich. Fl. p. 438; ed. 3, p. 468; var. *rhypontella* Leight. Lich. Fl. p. 439 (1871); ed. 3, p. 468.

Confused with *A. rhyponta*, but differs in the rougher more felted thallus, the form and size of the spores and the habitat, it being often found growing on the thallus of *Graphis* sp.

Hab. On bark, associated with, or growing over, *Graphis* sp.—*Distr.* Rare in S. and N. England and S. Ireland.—*B. M.* Sussex; Castle Bernard Park, Cork; Armagh.

12. **A. Taylori** Mudd Man. p. 302 (1861).—Thallus dark-brown, thin, forming irregular determinate spots. Perithecia black, minute, numerous, globose-conical, immersed at the base, the ostiole minutely papillate; perithecial wall entire, black; paraphyses free, slender; asci elongate-clavate; spores colourless, fusiform, 1-septate, constricted, the cells usually with two or more guttulæ, 0,025–30 mm. long, 0,004–5 mm. thick; hymenial gelatine yellow, the spores brown with iodine.—*Verrucaria Taylori* Carroll ex Nyl. in Maine et Loire Mém. Soc. Acad. iv. p. 82 (1858); Cromb. Lich. Brit. p. 120; Leight. Lich. Fl. p. 438; ed. 3, p. 467.

Exsicc. Carroll Lich. Hib. n. 29.

Hab. On trees, chiefly ash or oak.—*Distr.* Rare in S.W. England. Not uncommon in S. and S.W. Ireland.—*B. M.* Torquay, Devon; Glenbower Wood, Dunscombes Wood, Castle Bernard Park and Rostellan, Cork; Dinish, Killarney and Valentia Island, Kerry; Clare Glen, Tipperary.

13. **A. aphorisasa** A. L. Sm.—Thallus indicated by brownish-black detached well-defined spots. Perithecia black, almost

innate and hemispherical, many being congregated in each spot; perithecial wall dimidiate; paraphyses numerous, branching, indistinct; spores 4 to 8 in the ascus, colourless, at length brown, oblong, 1-septate, rather large, 0,020–28 mm. long, 0,005–7 mm. thick; hymenial gelatine tinted blue or violet with iodine.—*Verrucaria aphorisasa* Stirton in Grevillea iii. p. 36 (1874); Leight. Lich. Fl. ed. 3, p. 467. Specimen not seen.

Hab. On bark of elm at Grantown, Elgin.

Growing on rocks, sand or soil (or on mosses); spores 1-septate.

14. **A. saxicola** Massal. Symm. Lich. p. 107 (1855).—Thallus whitish or bluish-grey, thin, effuse or in patches, pulverulent. Perithecia minute, black, shining, semi-immersed; paraphyses mucilaginous, indistinct; spores 8 in the ascus, colourless, oblong-elongate, 1-septate, slightly constricted, colourless, 0,020–21 mm. long, 0,005 mm. thick.—*Verrucaria saxicola* Cromb. in Journ. Bot. xiv. p. 362 (1876)? Leight. Lich. Fl. ed. 3, p. 461.

Distinguished by the extremely minute perithecia, which are comparable with those of *Microthelia dispora*.

Hab. On calcareous rocks.—*Distr.* Rare in W. England.—*B. M.* Duntisborne, Gloucestershire.

15. **A. spilobola** A. L. Sm.—Thallus black, thin, evanescent. Perithecia black, small, somewhat prominent, crowded or aggregate; perithecial wall entire; paraphyses stoutish, entangled and indistinct; asci oblong-ovate; spores colourless, oblong-ovate, 1-septate, 0,015–20 mm. long, 0,005–8 mm. thick; hymenial gelatine not tinged with iodine.—*Verrucaria spilobola* Nyl. in Flora lv. p. 363 (1872); Leight. Lich. Fl. ed. 3, p. 469.

Nylander states that the gonidia are green and often 4-connate. In the specimen examined the gonidia are cells of *Trentepohlia*.

Hab. On rocks.—*B. M.* Craig Tulloch (the only locality).

16. **A. arenicola** A. L. Sm.—Thallus gelatinous when wet, dusky-olive-green, evanescent when dry. Perithecia black, hemispherical, semi-immersed, ostiole slightly depressed with a minute pore; perithecial wall entire; paraphyses slender, branched; spores colourless, oblong-ovoid, 1-septate, the cells granular, lower cell somewhat tapering, 0,021–22 mm. long, 0,008 mm. thick; asci and spores pale-brownish with iodine.—*Verrucaria arenicola* Leight. Lich. Fl. ed. 3, p. 470 (1879).

The thallus forms a thin layer over the sand; the dark, mucilaginous character is evidently due to the presence of blue-green algæ.

Hab. On wet sand-banks.—*B. M.* Shelton Rough near Shrewsbury, Shropshire (the only locality).

17. **A. areniseda** A. L. Sm.—Thallus ashy- or whitish-grey, continuous, granular, following the inequalities of the substratum,

somewhat furfuraceous. Perithecia very minute, black, semi-immersed, the upper part conical, opening by a rather wide ostiole; perithecial wall thin, entire; paraphyses numerous, slender, branched; asci elongate, slightly narrowed at each end, about 0,140 mm. long, 0,025 mm. thick; spores usually 8 in the ascus, elongate-clavate, the upper cell broader, sometimes with large guttulæ, colourless, 1-septate, large, 0,032–37 mm. long, 0,010 mm. thick.

The scanty algal symbiont is *Trentepohlia*, and has the deep yellow colour of the gonidia of many of the maritime species. The spores resemble somewhat those of *A. epidermidis*, but they are much larger. The specimen was collected by J. A. Wheldon.

Hab. On damp sandy shore.—*B. M.* Formby, Lancashire (the only locality).

18. **A. bryospila** A. L. Sm.—Thallus dark-brownish-black, thin. Perithecia black, minute, prominent, subconical; ostiole poriform; perithecial wall entire; paraphyses distinct, slender, branched; asci oblong, slightly narrower upwards; spores usually 8 in the ascus, sometimes 4 or 2, colourless, 1-septate, 0,027–44 mm. long, 0,008–012 mm. thick; hymenial gelatine not tinged with iodine.—*Verrucaria bryospila* Nyl. in Flora xlvii. p. 357 (1864); Carroll in Journ. Bot. iii. p. 293 (1865); Cromb. Lich. Brit. p. 120; Leight. Lich. Fl. p. 438; ed. 3, p. 470.

The British specimens are intermixed and somewhat over-grown by *Dermatocarpon cinereum*. There are 8 spores in the ascus, some of them of rather smaller size than those of the original Norwegian plant.

Hab. On mosses and schistose soil.—*B. M.* Ben Lawers, Perthshire (only British locality).

Parasitic and doubtful species; spores 1-*septate.*

19. **A. allogena** A. L. Sm.—Thallus wanting. Perithecia black, hemispherical; perithecial wall dimidiate; paraphyses indistinct; spores oblong or slightly clavate-oblong, colourless, 1-septate, one cell slightly thicker, 0,023–37 mm. long, 0,007–9 mm. thick.—*Verrucaria allogena* Nyl. in Flora xlviii. p. 357 (1865); Leight. Lich. Fl. p. 461; ed. 3, p. 492. *V. epidermidis* var. *allogena* Carroll in Journ. Bot. iv. p. 25 (1866); Cromb. Lich. Brit. p. 120.

Retained in this genus on account of the dimidiate apothecium, a strongly lichenological character. The spores are very like those of *A. epidermidis*, of which Nylander thought it might possibly be a variety.

Hab. Parasitic on the thallus of *Rhizocarpon petræum* var. *excentricum*.—*B. M.* Ben Lawers, Perthshire (the only locality).

20. **A. (?) colleta** A. L. Sm.—Thallus black, thin, continuous. Perithecia black, small, diameter 0·1–·2 mm. in diameter, spherical, at times almost aggregate; perithecial wall entire; spores 8 in the ascus, colourless, fusiform, often constricted at the middle, 1-septate, large, 0,032–45 mm. long, 0,010–13 mm. thick; paraphyses very indistinct; hymenial gelatine within the asci wine-red with iodine, the rest untinted.—*Verrucaria colleta* Stirton in Grevillea iii. p. 37 (1874); Leight. Lich. Fl. ed. 3, p. 468. Specimen not seen.

Stirton states that the "gonidia are seen interspersed, having, in many instances, a diameter from 0·016–20 mm., but it is questionable whether they belong to the thallus of this lichen." An aberrant species, possibly a pyrenomycetous fungus.

Hab. On *Gymnomitrium concinnatum* on Ben Lawers.

Maritime species growing on rocks by the sea; spores 1- (rarely 3-) septate.

21. **A. litoralis** A. L. Sm.—Thallus evanescent. Perithecia minute, black, scattered, prominent, or semi-immersed; perithecial wall dimidiate or subentire; paraphyses scanty, distinct; asci cylindrical or slightly swollen; spores oblong-ovate, colourless, 1-septate, the upper cell sometimes thicker, 0,012–19 mm. long, 0,005–7 mm. thick; hymenial gelatine brown with iodine.—*Verrucaria litoralis* Tayl. ex Leight. Angioc. Lich. p. 46, t. 20, fig. 2 (1851), & Lich. Fl. p. 440; ed. 3, p. 470 (non Tayl. in Hook. Journ. Bot. vi. p. 154 (1847)); Carroll in Journ. Bot. iii. p. 293 (1865); Cromb. Lich. Brit. p. 120. *V. consequens* Nyl. in Flora xlvii. p. 357 (1864) (fide Wedd. in Mém. Soc. Sci. Nat. Cherb. xix. p. 306 (1875)); Jones in Proc. Nat. Hist. Soc. Dublin iv. i. p. 149 (1864). *V. sublitoralis* Leight. Lich. Fl. p. 435 (1871); ed. 3, p. 461.

Hab. On shells or on rocks by the sea.—*Distr.* Rare in S. England, Wales and S. and N. Ireland.—*B. M.* Between Seaton and Beer and Mudstone Bay, Brixham, Devon; Goodwick Bay, Manorbeer and Tenby, Pembrokeshire; Robin Hood's Bay, Yorkshire; Ballinahassig, Cork; Glenarm, Antrim.

22. **A. foveolata** A. L. Sm.—Thallus thin, faintly yellowish-green or evanescent. Perithecia minute, black, almost completely immersed, leaving small pits in the substratum; perithecial wall subentire, black above, brown below; paraphyses very scanty or wanting, not mucilaginous; asci cylindrical-clavate, 0,070–80 mm. long, 0,017 mm. thick, 8-spored; spores 1-septate, colourless, oblong-ovate, thinner at the ends, 0,015–18 mm. long, 0,006–7 mm. thick.

Very near the preceding species in habitat and form of spores, but differing in size and degree of immersion of perithecia.

Hab. On shells by the sea-shore.—*B. M.* Robin Hood's Bay, Yorkshire (collected by Mr. E. M. Holmes).

23. **A. leptotera** A. L. Sm.—Thallus dark-olivaceous-green, somewhat gelatinous, smooth or cracked in drying, subdeterminate. Perithecia black, minute, subinnate; perithecial wall dimidiate; paraphyses breaking up or obsolete; asci oblong, ovate; spores oblong-clavate, 1-septate, the upper cell rather thicker, colourless, 0,016–18 mm. long, 0,005 mm. thick.—*Verrucaria leptotera* Nyl. in Flora xlviii. p. 212 (1865).

Distinguished from *A. litoralis* by the subgelatinous thallus and immersed apothecia.

Hab. On maritime rocks.—*Distr.* Rare in the Channel Islands.—*B. M.* Grève-au-Lançon, Jersey.

24. **A. halodytes** Oliv. Exp. Syst. Lich. France ii. 2, p. 261 (1901).—Thallus olivaceous-brown or blackish, thin, continuous or sparsely cracked, somewhat gelatinous. Perithecia small, black, slightly prominent, becoming impressed above, numerous and somewhat congregate, intermixed with spermogones; perithecial wall dimidiate; paraphyses few, irregular; asci inflated; spores oblong, 1-septate, slightly thicker at one end, 0,013–15 mm. long, 0,005–7 thick. *Verrucaria halodytes* Nyl. in Mém. Soc. Sci. Nat. Cherb. v. p. 142 (1857). *V. fluctigena* Nyl. in Flora lviii. p. 14 (1875) (fide Weddell in Mém. Soc. Sci. Nat. Cherb. xix. p. 307 (1875)); Leight. Lich. Fl. ed. 3, p. 462.

Differs from the preceding in the more prominent perithecia and in the shorter asci and spores. Nylander's specimen from Cherbourg is olivaceous-green in colour. Weddell (*l. c.*) describes the thallus as brown or brownish-black; he also adds a note on the algal symbiont, which, according to Bornet, is *Glœocapsa crepidinum* Thur., one of the Phycochromophyceæ. *V. fluctigena* has been referred by A. Zahlbruckner (Krypt. *exsicc.* n. 469) as a synonym to *A. Kelpii* Koerb. (Parerg. Lich. p. 387 (1868)).

Hab. On maritime rocks, washed by the waves.—Specimen cited by Leighton (*l. c.*) (under *V. fluctigena*) as from Crombie, but not found in Herb. Crombie.

Var. **Hollii** A. L. Sm.—Thallus dull-black, widely spreading, very minutely cracked-areolate. Perithecia as in the species.

The minute areolation, visible only with a high magnification, gives the thallus a somewhat scabrid look. The specimen was collected by H. B. Holl.

Hab. On rocks near the sea.—*Distr.* Rare in W. Wales.—*B. M.* On the road between Barmouth and Dolgelly, Merioneth.

25. **A. halizoa** A. L. Sm.—Thallus thin, effuse, continuous, pale-olivaceous or sage-green. Perithecia minute, black, scattered, prominent or semi-immersed; perithecial wall dimidiate or subentire; paraphyses scanty, distinct; asci cylindrical or slightly swollen; spores oblong-ovate, colourless, 1-septate, the upper cell sometimes larger, 0,010–12 mm. long, 0,005–7 mm. thick; hymenial gelatine yellow with iodine.—*Verrucaria halizoa* Leight. Lich. Fl. p. 436 (1871); ed. 3, p. 461.

Differs from *A. leptotera* in the thinner thallus, distinct paraphyses, and smaller spores.

Hab. On maritime rocks.—*Distr.* Rare on the coast of S.W. England and Wales, and E. Scotland.—*B. M.* Clevedon, Somerset; Manorbeer Bay, North Cliff and Giltar Points, Tenby, Pembrokeshire.

26. **A. viridula** A. L. Sm.—Thallus effuse, thin, greenish-olive, tartareous, smooth or slightly cracked. Perithecia immersed, hemispherical, emerging, the ostiole umbilicate; perithecial wall dimidiate, spreading and incurved at the base; spores colourless, linear-oblong, 1-septate, 0,017–19 mm. long, 0,006–7 mm. thick. —*Lichen viridulus* Sm. Engl. Bot. t. 2455 (1812) pro parte. *Verrucaria elæina* Borr. in Sm. Engl. Bot. under t. 2455, fig. 2 (1812); Hook. in Sm. Engl. Fl. v. p. 152; Leight. Angioc. Lich. p. 63, t. 27, fig. 2 & Lich. Fl. p. 436; ed. 3, p. 462. *Thelidium elæinum* Mudd Man. p. 296 (1861). Specimen not seen.

Perhaps identical with *A. halizoa*, to which the drawing in English Botany bears a strong resemblance.

Hab. On maritime slaty rocks.—*Distr.* Rare on the W. coast of Wales and W. Ireland.

27. **A. marina** A. L. Sm.—Thallus dark-olive-green, subgelatinous, smooth, determinate with a black line at the circumference. Perithecia minute, black, immersed in the thallus, the ostiole rather flat or slightly depressed; perithecial wall entire, black; paraphyses none; spores 8 in the ascus, minute, ellipsoid-oblong, colourless, 1-septate, becoming 3-septate at maturity, 0,009–14 mm. long, 0,003–5 mm. thick.—*Sagedia marina* Deakin in Ann. & Mag. Nat. Hist. ser. 2, xiii. p. 40, t. 4, fig. 13 (1854). *Verrucaria marina* Leight. Lich. Fl. p. 446 (1871); ed. 3, p. 477; Massee in Journ. Bot. xxx. p. 193, t. 324, fig. 8 (1892).

Similar to *A. leptotera* in appearance of thallus and perithecia, but differing in the structure and size of the spores. Weddell's *Verrucaria leptotera* var. *marmorans* (Mém. Soc. Sci. Nat. Cherb. xix. p. 309 (1875)) is probably identical with *A. marina*.

Hab. On maritime rocks below high tide.—*Distr.* Rare in the Channel Islands, S. England and E. and W. Scotland.—*B. M.* Grève-au-Lançon, Jersey; Torquay, Devon.

Growing on trees; spores 3-septate.

28. **A. rhyponta** Massal. Ric. Lich. p. 166 (1852).—Thallus thin, subeffuse, dark-brown or blackish, forming dark-coloured spots on the bark. Perithecia minute, hemispherical, semi-immersed, black; perithecial wall dimidiate; paraphyses almost obsolete; spores colourless or becoming slightly brownish, linear-oblong, 3-septate, 0,018–22 mm. long, 0,004–5 mm. thick; hymenial gelatine red or yellow-brown with iodine.—*Verrucaria rhyponta*

Ach. Lich. Univ. p. 282 (1810); Cromb. Lich. Brit. p. 120; Leight. Lich. Fl. p. 441; ed. 3, p. 471.

Often confused with *A. microspila*, owing to the dark-coloured thallus which in both occurs in rather small patches.

Hab. On bark of trees.—*Distr.* Very rare throughout the British Isles.—*B. M.* St. Leonard's Forest, Sussex; Airyholm, Cleveland, Yorkshire; Killin, Perthshire.

29. **A. Cerasi** Massal. Ric. Lich. p. 167 (1852).—Thallus greyish or brownish, thin, more or less shining, subdeterminate. Perithecia small, more or less elliptical, numerous, black, shining; perithecial wall dimidiate; paraphyses breaking up, often becoming almost obsolete; spores colourless, elongate-oblong, blunt at the ends, 3-septate, 0,015–25 mm. long, 0,004–8 thick. —*Verrucaria Cerasi* Ach. Meth. p. 119 (1803); Leight. Lich. Fl. p. 441; ed. 3, p. 471.

Distinguished by the shining thallus and the elliptical perithecia, a character that is sometimes rather obscure.

Hab. On the bark of cherry and other trees.—*Distr.* Rare in S. and S.W. England.—*B. M.* Hurstpierpoint, Sussex.

30. **A. Crombei** A. L. Sm.—Thallus effuse, thin, yellowish- or reddish-brown, rather shining. Perithecia scattered, small, hemispherical, immersed, the small poriform ostiole emerging; perithecial wall dimidiate; asci obovoid-cylindrical, about 0,055 mm. long, 0,017–20 mm. thick; paraphyses few, stoutish, entangled; spores 8 in the ascus, oblong-clavate, 3-septate, round at the ends, almost breaking up into halves, 0,20–22 mm. long, 0,005–6 mm. thick.

Differs from *A. submicans* in the form of the spores and the presence of paraphyses. The two specimens in the British Museum were collected at the same locality by Crombie, and one of them was determined by Nylander as *A. grisea* Koerb.; the latter, however, has 1-septate rather fusiform spores.

Hab. On bark of trees (alder).—*B. M.* Banks of the Garry, Blair Athole, Perthshire.

31. **A. submicans** A. L. Sm.—Thallus yellowish or pale-reddish-brown, thin, effuse. Perithecia numerous, small, hemispherical, shining, black, the ostiole minutely poriform; perithecial wall dimidiate; paraphyses very scanty or none; asci obclavate, rather short; spores 8 in the ascus, linear-oblong or slightly clavate, 4-guttulate, 1- then 3-septate, colourless, sometimes becoming brownish, 0,016–22 mm. long, 0,004–6 mm. thick.—*Verrucaria submicans* Nyl. in Flora lv. p. 363 (1872); emend. Leight. Lich. Fl. ed. 3, p. 471 (1879).

The spores originally described by Nylander as 2-celled only, remain so for a long time, the presence of the large guttulæ also tends to obscure the additional septa.

Hab. On trees.—*Distr.* Rare in S. and N. England, Wales and

Ireland.—*B. M.* Bosnieves, Cornwall; Lyndhurst, New Forest, Hants; Torquay, Devon; Capel Curig, Carnarvonshire; Ingleby and Westerdale, Cleveland, Yorkshire; near Muckruss, Killarney and Dromore, Kerry.

Growing on trees; spores 3–7-septate.

32. **A. platypyrenia** A. L. Sm.—Thallus effuse, thin, faintly brownish-yellow. Perithecia black, immersed at first, hemispherical-depressed, the ostiole a very minute pore; perithecial wall dimidiate; paraphyses branched, soft and irregular or indistinct; spores ellipsoid-oblong, 3–5-septate (rarely 7-septate), the central cells largest, colourless, sometimes becoming smoky-brown when old, 0,023–30 mm. long, 0,009–011 mm. thick.—*Verrucaria platypyrenia* Nyl. in Flora xlviii. p. 358 (1865); Leight. Lich. Fl. p. 450; ed. 3, p. 481. *V. epidermidis* var. *platypyrenia* Carroll in Journ. Bot. iv. p. 25 (1866); Cromb. Lich. Brit. p. 119 (1870).

Distinguished by the flattened perithecia and by the peculiar spore characters.

Hab. On bark of ivy and other trees.—*Distr.* Rare in S. and S.W. Ireland.—*B. M.* Ballyedmond, Enniskeam and Glenbower, Cork; Old Dromore, Kerry.

33. **A. chlorococca** A. L. Sm.—Thallus green, thickish, subsquamulose-granular. Perithecia minute, black, innate, convex or depressed above, the ostiole a minute pore; perithecial wall black, thin, scarcely visible under the base; asci ellipsoid rather short; paraphyses slender, mucilaginous, disappearing; spores 8 in the ascus, colourless or faintly yellowish, broadly fusiform, obtuse at the apices, 5–7-septate, 0,030–37 mm. long, 0,004–5 mm. thick.—*Verrucaria chlorococca* Leight. Lich. Fl. ed. 3, p. 484 (1879) emend.

Hab. On mossy bark of tree.—*B. M.* Stokenchurch, Chiltern Hills, Oxfordshire (the only locality).

34. **A. desistens** A. L. Sm.—Thallus scanty. Perithecia minute, black, prominent, the upper part convex; perithecial wall entire; paraphyses none; spores 8 in the ascus, colourless, fusiform, 3–5-septate, 0,011–16 mm. long, 0,003–4 mm. thick; hymenial gelatine wine-red with iodine.—*Verrucaria desistens* Nyl. in Flora l. p. 180 (1867); Carroll in Journ. Bot. v. p. 260 (1867); Cromb. Lich. Brit. p. 122; Leight. Lich. Fl. p. 450; ed. 3, p. 481. Specimen not seen.

Hab. On old trees.—*Distr.* Rare in S.W. Ireland (Torc Mt., Killarney, Kerry).

114. **LEPTORHAPHIS** Koerb. Syst. Lich. Germ. p. 371 (1855). (Pl. 50.)

Thallus crustaceous, thin, usually developed within the bark.

Perithecia simple, globose or semi-globose, black, innate-sessile; ostiole poriform; paraphyses persistent, branched and entangled; asci cylindrical, 4–8-spored; spores acicular-fusiform, straight or bent, 1- pluri-septate, colourless. Spermogones globose or ovoid, with rod-like spermatia.

Similar to *Arthopyrenia*, but with acicular spores.

1. **L. epidermidis** Th. Fr. Lich. Arct. p. 273 (1860).—Thallus very thin, cream-coloured or greyish, effuse, smooth. Perithecia elliptical-hemispherical, bursting the bark, black and somewhat shining; perithecial wall dimidiate, spreading at the base; paraphyses rather indistinct; spores 8 in the ascus, more or less curved, 1–5-septate, 0,020–37 mm. long, 0,003–4 mm. thick.—*Lichen epidermidis* Ach. Lich. Suec. Prodr. p. 16 (1798). *Verrucaria epidermidis* var. *albissima* Ach. Lich. Univ. p. 276 (1810). *V. oxyspora* Nyl. in Bot. Not. 1852, p. 179; Cromb. Lich. Bot. p. 121. *V. albissima* Nyl. Lich. Scand. p. 282 (1861); Leight. Lich. Fl. p. 449; ed. 3, p. 481. *Arthopyrenia oxyspora* Mudd Man. p. 306 (1861).

Exsicc. Mudd n. 299.

Hab. On bark of birch.—*Distr.* Rare throughout England, Scotland and S. and W. Ireland.—*B. M.* Pease Pottage Gate, Sussex; Thorndon Hall near Brentwood, Essex; Dolgelly, Merioneth; Hoggart's Wood, Ingleby, Cleveland; Swanston Wood, Edinburgh; Glen Falloch, Perthshire; Morrone, Braemar, Aberdeenshire; Killarney, Kerry.

2. **L. Carrollii** A. L. Sm.—Thallus crustaceous, thin, brownish. Perithecia minute, black, scattered, hemispherical, immersed at the base, opening by a small pore; perithecial wall dimidiate; paraphyses slender, branched and entangled; asci elongate-cylindrical, about 0,090–100 mm. long, 0,010 mm. thick; spores 8, parallel in the ascus, slender, acicular, indistinctly multi-septate, 0,050–80 mm. long, 0,001–2 mm. thick, straight or variously bent.

Distinguished by the long slender spores. The perithecia are rather few and scattered.

Distr. On bark of trees.—*B. M.* Glenbower, Cork (the only locality).

115. **MICROTHELIA** Koerb. Syst. Lich. Germ. p. 372 (1855); emend. Massal. Misc. Lich. p. 57 (1856). (Pl. 51.)

Thallus crustaceous, superficial or developed within the substratum, not corticated. Perithecia small, superficial or semi-immersed, semi-globose; paraphyses branched, entangled, sometimes mucilaginous and disappearing; asci cylindrical-clavate or pyriform, 2–8-spored; spores ovate or elongate-fusiform, usually 1-septate, rarely 3–5-septate, brown. Spermogones globose, minute, with short rod-like spermatia.

1. **M. micula** Flot. ex Koerb. Lich. Syst. Germ. p. 373 (1855). —Thallus pale-whitish-brown, thin, smooth, effuse. Perithecia minute, black, hemispherical, semi-immersed; perithecial wall dimidiate; spores 8 in the ascus, dark-brown, oblong, 1-septate, slightly constricted, the upper cell rather larger, 0,015–25 mm. long, 0,005–7 mm. thick (usually about 0,017 mm. long, 0,005 mm. thick).—*Verrucaria Lyellii* Leight. Angioc. Lich. p. 42, t. 18, fig. 3 (1851)? *V. cinerella* Flot. ex Nyl. in Maine et Loire Mém. Soc. Acad. iv. p. 60 (1858) & Lich. Scand. p. 281 (non Nyl. in Ann. Sci. Nat. sér. 3, iii. p. 174 (1855)); Carroll in Journ. Bot. iii. p. 293 (1865); Cromb. Lich. Brit. p. 121; Leight. Lich. Fl. p. 437; ed. 3, p. 465.

The species *Verrucaria cinerella* Nyl. (Ann. Sci. Nat. *l. c.*) is a Chilian plant, and has faintly coloured large spores, measuring 0,032-36 mm. long, 0,009-011 mm. thick; the characters of the British specimens agree with those republished by Nylander in Lich. Scand. *l. c.*

Hab. On trees.—*Distr.* Rare in S. and W. England, more frequent in S. and W. Ireland, not recorded from Scotland.—*B. M.* Sapperton, Gloucestershire; Glengariff, Cork; Torc Mt., Crogham, Mangerton and Dinish, Killarney, Lough Inchiquin, Glencar and Old Dromore, Kerry.

Var. **megaspora** A. L. Sm.—Similar to the species but with larger spores, 0,023–36 mm. long, 0,009–013 mm. thick—*Verrucaria cinerella* var. *megaspora* Nyl. in Flora li. p. 348 (1868); Cromb. Lich. Brit. p. 121 & in Journ. Linn. Soc. xi. p. 490 (1871); Leight. *ll. c.* Specimen not seen.

Hab. On trees.—*Distr.* Rare in S. England, New Forest, Hants.

2. **M. atomaria** Koerb. Syst. Lich. Germ. p. 373 (1855).— Thallus thin, greyish. Perithecia minute, hemispherical, semi-immersed, somewhat shining; spores ellipsoid-oblong, 1-septate, dark-brown, small, 0,012–14 mm. long, 0,004–6 mm. thick.— *Lichen atomarius* Ach. Lich. Suec. Prodr. p. 16 (1798)? *Verrucaria atomaria* DC. Fl. Franc. ii. p. 313 (1805); Leight. Lich. Fl. ed. 3, p. 467.

Hab. On bark of hazel, &c.—*Distr.* Rare in W. Ireland, Kylemore, Connemara, Galway.

3. **M. dispora** A. L. Sm.—Thallus greyish-white, pulverulent, very thin or disappearing. Perithecia minute, 0,150–200 mm. in diameter, almost globose, shining, black, semi-immersed or almost superficial, or leaving shallow pits in the substratum; perithecial wall black, rather soft, almost entire; paraphyses slender branched and entangled; asci elongate-clavate, somewhat thickened at the apex, 0,065 mm. long, 0,015 mm. thick, 2-spored; spores oblong, blunt or tapering at one or both ends,

1-septate constricted, brown 0,025–35 mm. long, 0,010–12 mm. thick.

Apt to be confused with *Arthopyrenia saxicola* on account of the minute shining perithecia. The specimens in the British Museum were collected by W. Joshua and labelled by him *A. saxicola* var.

Hab. On calcareous rocks.—*Distr.* Rare in W. England.—*B. M.* Sapperton, Gloucestershire.

4. **M. exerrans** A. L. Sm.—Thallus thin, blackish, scattered. Perithecia minute, black; perithecial wall entire; spores 8 in the ascus, blackish, oblong, 1-septate, 0,010–15 mm. long, 0,003–5 mm. thick; hymenial gelatine wine-red with iodine.—*Endococcus exerrans* Nyl. in Flora lxii. p. 360 (1879); Cromb. in Grevillea viii. p. 114 (1880). Specimen not seen.

Distinguished by the narrow spores. Nylander notes the rather thick colourless chroolepoid gonidia with cells 0,018–23 mm. thick.

Hab. On quartzose stones, Ben-y-Gloe, Blair Athole, Perthshire.

5. **M. dissepta** A. L. Sm.—Thallus whitish-grey, sometimes faintly yellowish, tartareous, thin, slightly cracked-areolate, subdeterminate. Perithecia black, numerous, somewhat prominent, the upper part convex, the ostiole a minute pore; perithecial wall entire, paraphyses indistinct; spores 8 in the ascus, ellipsoid, brown, 3-septate, 0,018–22 mm. long, 0,007–010 mm. thick; hymenial gelatine not tinged with iodine.—*Verrucaria dissepta* Nyl. in Flora lix. p. 576 (1876); Cromb. in Grevillea v. p. 107; Leight. Lich. Fl. ed. 3, p. 480. Specimen not seen.

Nylander (*l. c.*) suggests that possibly the perithecia may be parasitic on the thallus of some other lichen.

Hab. On mica-schist rocks, Doughruagh Mts., Connemara, Galway (the only locality).

116. **PORINA** Ach. Lich. Univ. p. 60 (1810) pro parte; emend. Muell.-Arg. in Flora lxvi. p. 320 (1883).—*Segestrella* Fr. Lich. Eur. p. 460 (1831) (*Segestria* tom. cit. p. 429); Mudd Man. p. 283. (Pl. 52.)

Thallus variously crustaceous, not corticated, sometimes developed within the substratum. Perithecia simple, superficial or semi-immersed; perithecial wall light-coloured, becoming darker towards the ostiole, entirely dark-coloured or dimidiate; paraphyses persistent, simple; asci elongate, 6–8-spored; spores elongate-fusiform or clavate, colourless, 2- multi-septate. Spermogones small, globose with simple or branched sterigmata and rod-like or elongate-fusiform spermatia.

Distinguished from *Arthopyrenia* by the character of the paraphyses. The texture of the perithecial wall is also more variable; it is usually softer in texture, and in some species waxy and light-coloured (*Segestrella*).

Perithecia brightly coloured, waxy; spores 3–7-septate.

1. **P. lectissima** A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, p. 66 (1903).—Thallus pale-olivaceous or reddish-yellow, thin, continuous, subtartareous, effuse. Perithecia small, pale-reddish, semi-immersed, with a rather large ostiole; perithecial wall reddish, dimidiate; paraphyses slender, distinct, longer than the asci; spores 8 in the ascus, fusiform, colourless, 3-septate, 0,022–32 mm. long, 0,004–7 mm. thick; hymenial gelatine not tinged with iodine.—*Segestria lectissima* Fr. Syst. Orb. Veg. i. p. 287 (1825). *Verrucaria irrigua* Tayl. in Mackay Fl. Hib. ii. p. 94 (1836); Leight. Angioc. Lich. p. 56, t. 24, fig. 4. *V. rubiginosa* Tayl. *l. c.*? *V. erysiboda* Tayl. tom. cit. p. 98; Leight. *l. c.* t. 24, fig. 6. *V. lectissima* Nyl. in Bot. Not. 1853, p. 181 pro parte; Cromb. Lich. Brit. p. 117 (excl. syn. *Segestria umbonata*); Leight. Lich. Fl. p. 443; ed. 3, p. 475. *V. holochrodes* Nyl. in Flora lix. p. 311 (1876); Cromb. in Grevillea v. p. 29; Leight. Lich. Fl. ed. 3, p. 476. *Segestrella lectissima* Mudd Man. p. 284 (1861).

Exsicc. Larb. Lich. Cæsar. n. 49, n. 120 (as *Verrucaria holochrodes*); Leight. n. 32 (as *V. irrigua* var. *erysiboda* pro parte).

Easily distinguished by the numerous brightly coloured perithecia; it has been confused with *Lichen thelostomus* Sm., but the latter has much larger perithecia and simple spores.

Hab. On moist rocks.—*Distr.* Rare in the Channel Islands and S.W. England, more frequent in Wales and in S. and W. Ireland, rare in Scotland.—*B. M.* La Coupe and Rozel, Jersey; Dolgelly, Merioneth; Breiddow, Montgomeryshire; Cwm Idwyll, Cwm Cywion, Bettws-y-Coed and Ffridd-du, near Aber, Carnarvonshire; Ballaghbeama Gap, Crogham, Killarney and Carig, Kerry; Doughruagh Mts., Killery Bay, Connemara, Galway.

2. **P. humicolor** A. L. Sm.—Thallus thin, brownish. Perithecia scattered or crowded, globose, reddish-brown or blackish, prominent with a slightly beaked ostiole; perithecial wall entire, reddish-yellow in thin sections; paraphyses distinct; spores 8 in the ascus, elongate-fusiform, 3-septate, 0,024–33 mm. long, 0,004–5 mm. thick.—*Verrucaria humicolor* Nyl. in Flora lx. p. 462 (1877); Cromb. in Grevillea vi. p. 114; Leight. Lich. Fl. ed. 3, p. 478.

Exsicc. Larb. Lich. Hb. without number.

Hab. On peaty earth and on rocks among liverworts.—*B. M.* Mwellan, Connemara, Galway (the only locality).

3. **P. leptalea** A. L. Sm.—Thallus thin, greyish, effuse or brownish and subdeterminate. Perithecia minute, hemispherical, almost superficial, reddish, shining, becoming darker especially round the ostiole; perithecial wall dimidiate; paraphyses slender, distinct; spores 8 in the ascus, colourless, 3-septate, 0,016–23

mm. long, 0,003–5 mm. thick—*Biatora leptalea* Dur. & Mont. Fl. d'Alg. i. p. 268 (1849). *Verrucaria lectissima* f. *leptalea* Nyl. in Maine & Loire Mém. Soc. Acad. iv. p. 38 (1858); subsp. *leptalea* Cromb. Lich. Brit. p. 117; var. *leptalea* Leight. Lich Fl. p. 443; ed. 3, p. 475. *V. leptaleella* Nyl. in Flora lix. p. 237 (1876); Cromb. in Grevillea v. p. 29; Leight. Lich. Fl. ed. 3, p. 480 pro parte.

Exsicc. Larb. Lich. Hb. without number.

V. leptaleella was given specific rank by Nylander on account of its narrower spores; they resemble, when mature, those of *P. leptalea*.

Hab. On trees.—*Distr.* Rare in S. England, Wales, and S. and W. Ireland.—*B. M.* Near Crosshaven and Glenbower, Cork; McCarthy's Island, Dinish and Eagle's Nest, Killarney, Kerry; Delphi, Killery Bay, Connemara, Galway.

4. **P. succina** A. L. Sm.—Thallus dark-brownish, thin, effuse. Perithecia numerous, large, amber-coloured throughout, hemispherical-conical with a papillate ostiole; perithecial wall dimidiate, spreading at the base; paraphyses slender, distinct; asci linear-clavate; spores 8 in the ascus, colourless, fusiform, 7-septate, large, 0,046 mm. long, 0,005–8 mm. thick.—*Verrucaria succina* Leight. in Grevillea iv. p. 78 (1875) & in Trans. Linn. Soc. ser. 2, i. p. 145, t. 2, figs. 8–12 (1876); Lich. Fl. ed. 3, p. 483; Cromb. in Journ. Bot. xiv. p. 363 (1876). *V. globosa* Tayl. ex Nyl. in Flora lxvi. p. 534 (1883); Cromb. in Grevillea xii. p. 91.

Considered by Leighton to be closely allied to *P. faginea*, but its affinity is rather with *P. lectissima*, from which it differs chiefly in the larger perithecia and spores.

Hab. On rocks.—*Distr.* Rare in S. and W. Ireland.—*B. M.* Blackwater, Wexford.

Perithecia dark-coloured; spores 3-septate.

5. **P. carpinea** A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, p. 66 (1903).—Thallus thin, developed within the bark, grey, olive, or dark-brown, smooth or somewhat wrinkled, effuse or determinate. Perithecia small, black, shining, sessile and subglobose; perithecial wall dimidiate; paraphyses numerous, slender, involved in mucus but distinct, not branched; asci elongate-cylindrical or -clavate; spores fusiform, 3-septate, colourless, usually 0,016–20 mm. long, 0,004–6 mm. thick, sometimes longer and slightly thicker.—*Verrucaria carpinea* Pers. ex Ach. Meth. p. 120 (1803). *V. fusiformis* Leight. Angioc. Lich. p. 42, t. 18, fig. 2 (1851). *V. chlorotica* f. *carpinea* Cromb. Lich. Brit. p. 116 (1870); Leight. Lich. Fl. p. 445; ed. 3, p. 473. *Arthopyrenia macularis* var. *fusiformis* Mudd Man. p. 301 (1861).

Exsicc. Bohl. n. 82 (as *Verrucaria olivacea*); Leight. n. 99; Mudd n. 289; Carroll Lich. Hib. n. 34.

Similar to *P. chlorotica* in the form and contents of the perithecia, but differing in habitat and in the structure of the thallus. There

has been considerable confusion between this plant and *Verrucaria olivacea* Borr.: the latter has much longer multiseptate spores.

Hab. On bark of trees.—*Distr.* Frequent in the Channel Islands, England, and S., W. and Central Ireland, very rare in Scotland.—*B. M.* Torquay, Devon; Crawley, Sussex; Ulting, Essex; near Norton, Worcester; Shelton Rough, near Shrewsbury, and Church Stretton, Shropshire; Gwydir Woods, Bettws-y-Coed and Trefriw, Carnarvonshire; Ayton, Sowerdale and Cliffrigg, Cleveland, Yorkshire; Castle Bernard, Enniskean, Crosshaven and Tullagreen, Cork; Glencar and Killarney, Kerry; Killdare, Clare; Maam Turk Mts. and Dawros Bridge, Connemara, Galway; Armagh.

6. **P. affinis** A. Zahlbr. *l. c.*—Thallus whitish-grey or brownish, effuse, smooth or wrinkled. Perithecia black, minute, hemispherical, semi-immersed, becoming prominent; perithecial wall dimidiate; paraphyses distinct, slender, loose; asci small, elongate cylindrical, slightly swollen in the middle; spores 6–8 in the ascus, colourless, cylindrical-fusiform, 3-septate, 0,014–21 mm. long, 0,003–4 mm. thick.—*Sagedia affinis* Massal. Mem. Lich. p. 138, t. 25, fig. 169 (1853). *Verrucaria affinis* Cromb. in Journ. Bot. xiv. p. 362 (1876); Leight. Lich. Fl. ed. 3, p. 472.

Exsicc. Larb. Lich. Hb. n. 119.

Closely related to the preceding, but with more distinct paraphyses and with smaller asci and spores, the latter being often rather blunt at the ends.

Hab. On bark of trees, holly, birch, &c.—*Distr.* Rare in W. Ireland.—*B. M.* Doughruagh Mts., Loughcooter, Letterfrack and Kylemore, Connemara, Galway.

7. **P. chlorotica** Wainio Lich. Brésil ii. p. 224 (1890).—Thallus greyish, olivaceous or brown, thin, effuse or determinate, continuous or slightly cracked or sometimes granular. Perithecia small, black, almost globose and superficial or slightly immersed, minutely papillate at the ostiole; perithecial wall incurved at the base, dimidiate; paraphyses numerous, slender, distinct; asci elongate-cylindrical; spores elongate-fusiform, colourless, 3-septate, usually about 0,016–20 mm. long, 0,004–6 mm. thick, rarely somewhat larger.—*Verrucaria chlorotica* Ach. Lich. Univ. p. 283 (1810); Cromb. Lich. Brit. p. 116 (excl. f. *carpinea*); Leight. Lich. Fl. 444; ed. 3, p. 472 (incl. ff. *trachona* & *subintegra* and var. *codonoidea*, excl. f. *carpinea*). *V. trachona* Ach. Meth. Suppl. p. 16 (1803); Engl. Bot. t. 2647? Tayl. in Mackay Fl. Hib. ii. p. 93 (1836) pro parte; Leight. Angioc. Lich. p. 50, t. 22, fig. 1. *V. perminuta* Deakin in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 35, t. 2, fig. 6 (1854); Leight. Lich. Fl. p. 450; ed. 3, p. 482. *V. Harrimanni* Leight. Lich. Fl. ed. 3, p. 476 (1879) (non Ach.). *V. codonoidea* Leight. Angioc. Lich. p. 53, t. 23, fig. 3 (1851). *V. subintegra* Nyl. in Flora xlviii. p. 212 (1865); Cromb. Lich. Brit. p. 116. *Arthopyrenia macularis* Mudd Man. p. 300, t. 5, fig. 125 (1861) (incl. vars. *codonoidea* & *trachona*, excl.

var. *fusiformis*). *Sagedia Harrimanni* Koerb. Syst. Lich. Germ. p. 362 (1855).

Exsicc. Mudd n. 288 (as *A. macularis*); Leight. n. 138 (as *V. codonoidea*); Larb. Lich. Hb. n. 197 (as *V. Harrimanni*), without number.

The type specimen of *V. perminuta* in the British Museum has 4-celled spores, and is otherwise similar to *P. chlorotica*. Several species or varieties have been founded on slight differences of perithecia and of the thallus, which varies from greyish-green to dark-brown in colour. The specimen of *Verrucaria trachona* from Acharius in the possession of the Linnean Society is a spermogonial form, possibly of *P. chlorotica*. In the Sowerby herbarium there is a specimen of *P. chlorotica* from Miss Hutchins, the original collector of *V. trachona* in Ireland, but the specimen has been labelled by Borrer as *Verrucaria viridula*, and does not altogether correspond with the one figured in Engl. Bot.

Hab. On rocks.—*Distr.* Not uncommon in the Channel Islands, England, Wales, and Ireland; not recorded from Scotland.—*B. M.* Jerbourg, Guernsey; Boulay Bay, La Coupe, Rozel and Trinity, Jersey; Withiel, Cornwall; Torquay, Devon; Bathford Hill and Weston-super-Mare, Somerset; Barnsley Park, Gloucestershire; Haughmond Hill, Shropshire; Bettws-y-Coed and Trefriw, Carnarvon; Buxton, Derbyshire; Bilsdale, near Ayton, Cleveland, Yorkshire; Blackwater and Derriquin, Killarney, Kerry; Kylemore, near Tully, Doughruagh and Glen Tuagh, Connemara, Galway; Cliffs of Moher, Clare.

Var. **persicina** A. L. Sm.—Thallus whitish or sometimes rose-coloured or purplish-red. Spores more obtuse at the ends than in the species.—*Verrucaria linearis* Leight. Angioc. Lich. p. 52, t. 23, fig. 1 (1851) & Lich. Fl. p. 441; ed. 3, p. 475; Cromb. Lich. Brit. p. 116. *V. chlorotica* f. *persicina* Nyl. in Maine et Loire Mém. Soc. Acad. iv. p. 36 (1858). *Sagedia persicina* Koerb. Syst. Lich. Germ. p. 364 (1855). *Arthopyrenia linearis* Mudd Man. p. 300 (1861) e descript.

Leighton (Angioc. Lich. p. 52) refers to this variety as the small lichen figured along with *V. Dufourii* in Engl. Bot. Suppl. t. 2791.

Hab. On calcareous rocks.—*Distr.* Rare in N. and S.W. England and W. Ireland.—*B. M.* Woodale, Buxton, Derbyshire; in a cave, Derryclare, near Kylemore, Connemara, Galway.

8. **P. tenuifera** A. L. Sm.—Thallus dark-grey or blackish, thin, continuous or cracked. Perithecia minute, black, hemispherical with a minute ostiole; perithecial wall dimidiate; paraphyses slender, distinct; spores colourless, elongate-acicular, 3-septate, 0,029–35 mm. long, 0,003–4 mm. thick.—*Verrucaria tenuifera* Nyl. in Flora lix. p. 237 (1876); Cromb. in Grevillea v. p. 29; Leight. Lich. Fl. ed. 3, p. 476. *V. pertenuis* Leight. in Trans. Linn. Soc. ser. 2, i. p. 239, t. 32, fig. 20 (1878) & Lich. Fl. ed. 3, p. 476.

There is no specimen of *V. tenuifera* in the British Museum, but Larbalestier states that the specimen of *V. pertenuis*, collected

at Goodwich Bay, is identical with his original specimen of *V. tenuifera* collected at Jersey.

Hab. On rocks.—*Distr.* Rare in the Channel Islands and S. Wales.—*B. M.* Goodwich Bay, Pembrokeshire.

9. **P. epigæoides** A. L. Sm.—Thallus pale-greenish, thin, resembling a greenish spot. Perithecia black, small, semi-immersed; perithecial wall black over the upper half, brown below; paraphyses slender, distinct; spores 8 in the ascus, elongate, fusiform, 3-septate, 0,018–27 mm. long, 0,005–8 mm. thick.—*Verrucaria epigæoides* Nyl. in Flora l. p. 329 (1867); Carroll in Journ. Bot. v. p. 259 (1867); Cromb. Lich. Brit. p. 116; Leight. Lich. Fl. p. 446; ed. 3, p. 477.

Hab. On sandy soil.—*Distr.* Rare in S.W. Ireland.—*B. M.* Moher, Clare.

Perithecia dark-coloured; spores 3–7- (*rarely more-*) *septate.*

10. **P. olivacea** A. L. Sm.—Thallus effuse, thin, continuous or becoming slightly cracked, smooth or somewhat wrinkled, dull olive-brown. Perithecia hemispherical, small, numerous, prominent, immersed at the base, black; perithecial wall dimidiate; paraphyses stoutish, free; asci cylindrical-clavate; spores elongate-clavate, 3–7-septate, colourless, 0,027–40 mm. long, 0,004–5 mm. thick.—*Verrucaria olivacea* Pers. in Ust. Ann. Bot. vii. p. 28 t. 3, fig. 6 (1794)? Borr. in Sm. Engl Bot. Suppl. t. 2597, fig. 1 (1829); Hook. in Sm. Engl. Fl. v. p. 150; Tayl. in Mackay Fl. Hib. ii. p. 89; Leight. Angioc. Lich. p. 42, t. 18, f. 1 & Lich. Fl. p. 452; ed. 3, p. 483; Cromb. Lich. Brit. p. 117. *Arthopyrenia olivacea* Mudd Man. p. 301 (1861).

Exsicc. Bohl. n. 82; Leight. n. 199; Mudd n. 290.

Hab. On the bark of trees.—*Distr.* Rather rare throughout England and Wales and S. and W. Ireland, not recorded from the Channel Islands nor from Scotland.—*B. M.* Duncton and Henfield, Sussex; Shiere, Surrey; Silbertswold, Kent; near Cirencester and Stowell Park, Gloucestershire; Malloch Tor, Derbyshire; Gwydir Woods, Bettws-y-Coed, Carnarvonshire; Easby Wood and Sowerdale, Cleveland, Yorkshire; Tullagreen and Ballyedmond, Cork; Muckruss, Killarney, Kerry; Killaloe, Clare; Loughcooter, Galway.

11. **P. faginea** Arn. in Flora lxviii. p. 166 (1885).—Thallus whitish or cream-coloured, thin, effuse. Perithecia black, minute, semi-immersed, hemispherical; perithecial wall dimidiate; paraphyses crowded, distinct; spores broadly lanceolate-fusiform, colourless, usually 5–7- (rarely more-) septate; 0,030–37 mm. long, 0,003–7 mm. thick.—*Sagedia faginea* (sub *Segestria*) Schær. Enum. p. 208 (1850). *S. lactea* Koerb. Syst. Lich. Germ. p. 366 (1855). *Verrucaria lactea* Leight. Lich. Fl. p. 452; ed. 3, p. 483.

Hab. On trees.—*Distr.* Rare in S. England (Sussex).

12. **P. leptospora** A. L. Sm.—Thallus very thin, brown. Perithecia minute, black, hemispherical, the base immersed; the ostiole a minute papilla; perithecial wall entire, or thin under the base; paraphyses scanty, distinct; asci cylindrical, slightly narrower upwards, about 0,090 mm. long, 0,010–12 mm. thick; spores 8 in the ascus, colourless, elongate-fusiform, 8- or more-septate, 0,045–55 mm. long, 0,003–4 mm. thick.—*Verrucaria leptospora* Nyl. in Flora xlvii. p. 487 (1864) & li. p. 164 (1868); Carroll in Journ. Bot. vi. p. 101 (1868); Cromb. Lich. Brit. p. 117; Leight. Lich. Fl. p. 452; ed. 3, p. 484.

Outwardly very similar to *P. olivacea*, but differing in the character of the spores.

Hab. On bark of holly.—*B. M.* Dinish, Killarney, Kerry.

13. **P. furvescens** A. L. Sm.—Thallus brown or olivaceous-brown, granulate, unequal, thin, effuse not continuous. Perithecia black, moderate in size, innate, the conical ostiole projecting; perithecial wall entire; paraphyses slender, crowded; spores 8 in the ascus, colourless, fusiform, 3–5-septate, 0,031–33 mm. long, 0,006 mm. thick.—*Verrucaria furvescens* Nyl. in Flora xlvii. p. 356 (1864); Carroll in Journ. Bot. iii. p. 293 (1865); Cromb. Lich. Brit. p. 117; Leight. Lich. Fl. p. 450; ed. 3, p. 481.

Considered by Nylander to be nearly allied to *P. chlorotica*. The single specimen in the herbarium is too meagre for examination; Carroll (*l. c.*) states that in the specimens examined by him the spores are only 3-septate.

Hab. On the ground on mosses.—*B. M.* Summit of Ben Lawers, Perthshire (the only locality).

14. **P. insiliens** A. L. Sm.—Thallus dirty-brownish-white, thickish, tartareous, deeply cracked, subfurfuraceous. Perithecia large, imbedded in rather large hemispherical thalline tubercles, the ostiole papillate, emerging; perithecial wall blackish-brown, dimidiate, the inner wall pale-brown; paraphyses slender, distinct; spores 8 in the ascus, broadly fusiform, obtuse at the apices, 5–7-septate, 0,050–67 mm. long, 0,011–14 mm. thick; hymenial gelatine colourless with iodine.—*Verrucaria insiliens* Larb. ex Nyl. in Flora lx. p. 566 (1877); Cromb. in Grevillea vi. p. 114; Leight. Lich. Fl. ed. 3, p. 484. Specimen not seen.

Hab. In deep recesses of caves, Twelve Pins, Connemara, Galway (the only locality).

15. **P. Curnowii** A. L. Sm. in Journ. Bot. xlix. p. 44, t. 510, f. 9 (1911).—Thallus olivaceous-brown, tartareous, thin, unequal, continuous or cracked. Perithecia scattered, black, small, hemispherical, immersed at the base, the ostiole a minute papilla, scarcely visible; perithecial wall dimidiate; paraphyses numerous, slender; asci cylindrical-clavate, 0,080 mm. long, 0,007–8 mm. thick; spores 8 in the ascus, narrowly fusiform, 7- or more-septate, about 0,052 mm. long, 0,003 mm. thick.

Allied to the following, but differing in the character of the spores and in the size and form of the perithecia.

Hab. On conglomerate fragments of rocks.—*B. M.* Penzance, Cornwall (the only locality).

16. **P. lucens** A. L. Sm.—Thallus purplish- or greyish-brown, thin, tartareous, continuous or minutely cracked, sometimes limited by a black line. Perithecia shining black, moderate in size, sessile, sometimes congregate, prominent, hemispherical, the ostiole a depressed pore; perithecial wall dimidiate; paraphyses slender, numerous; spores 8 in the ascus, broadly elongate-fusiform-clavate, up to 7- (rarely more-) septate, sometimes a cell with a longitudinal division, colourless, large, 0,038–50 mm. long, 0,008–010 mm. thick.—*Verrucaria lucens* Tayl. in Mackay Fl. Hib. ii. p. 257 (1836); Leight. Angioc. Lich. p. 55, t. 24, fig. 2 & Lich. Fl. p. 451; ed. 3, p. 482. *Arthopyrenia lucens* Mudd Man. p. 299 (1861).

Exsicc. Larb. Lich. Hb. n. 280.

Hab. On rocks and stones.—*Distr.* Rare in the Channel Islands, Wales, and S. and W. Ireland.—*B. M.* Jerbourg, Guernsey; Trefriw Falls and Conway Falls, Carnarvonshire; Wastdale Head, Cumberland; Crogham, Killarney, Kerry; Killery Bay, Connemara, Galway.

17. **P. interseptula** A. L. Sm.—Thallus olivaceous or purplish-brown, thin, effuse. Perithecia black, small, prominent, subglobose, sessile, somewhat shining, the ostiole scarcely visible; perithecial wall dimidiate; paraphyses slender, numerous, free; asci elongate, narrowed at both ends, 8-spored; spores broadly fusiform, 5-septate with occasional somewhat oblique longitudinal septa, colourless, 0,018–24 mm. long, 0,006–7 mm. thick.—*Verrucaria interseptula* Nyl. in Flora lxiv. p. 453 (1881); Cromb. in Grevillea xii. p. 91.

Strongly resembling the preceding in form of thallus and perithecia, but differing in the size and form of the spores; the longitudinal septa are more constantly present in one or two of the cells than in *P. lucens*.

Hab. On moist siliceous rocks.—*B. M.* Wastdale, Cumberland.

117. **THELOPSIS** Nyl. in Mém. Soc. Sci. Nat. Cherb. iii. p. 194 (1855); emend. A. Zahlbr. in Engler & Prantl Nat. Pflanzenf. i. 1*, p. 67 (1903). (Pl. 53.)

Thallus crustaceous, not corticated, thin or scarcely visible. Perithecia surrounded by the thallus, becoming prominent and superficial, or immersed in the thallus; perithecial wall soft, light-coloured or dark; paraphyses slender, persistent, unbranched, free; asci many-spored; spores ellipsoid or elongate, usually 1–3-septate, rarely simple, colourless.

Differs from all other genera of the order in the many-spored asci.

1. **Th. rubella** Nyl. tom. cit. pp. 194 & 202.—Thallus indistinct, greyish, or obsolete. Perithecia pale-reddish, spherical, prominent, with a distinct poriform ostiole; perithecial wall colourless in lower portion; asci with 100 or more spores; paraphyses slender, septate; spores ellipsoid, 3-septate, 0,010–17 mm. long, 0,005–8 mm. thick; hymenial gelatine wine-red with iodine.—Carroll in Journ. Bot. vi. p. 101 (1868); Cromb. Lich. Brit. p. 123. *Verrucaria rubella* Leight. Lich. Fl. p. 442 (1871); ed. 3, p. 472.

Hab. On the bark of trees.—*Distr.* Rare in Central Scotland and S.W. Ireland.—*B. M.* Lanrick Castle, near Doune, Perthshire.

2. **Th. melathelia** Nyl. in Flora xlvii. p. 358 (1864).—Thallus almost obsolete. Perithecia black, prominent, somewhat wrinkled and irregular; perithecial wall blackish or reddish, entire; paraphyses slender, distinct; spores many in the ascus, ellipsoid or oblong, 3-septate, 0,014–18 mm. long, 0,004–7 mm. thick; hymenial gelatine blue, then dark-violet, with iodine.—Carroll in Journ. Bot. iii. p. 293 (1866); Cromb. Lich. Brit. p. 123. *Verrucaria melathelia* Leight. Lich. Fl. p. 447; ed. 3, p. 478.

Hab. Incrusting mosses on the ground.—*Distr.* Rare in mountainous regions.—*B. M.* Above Loch-na-gat, Ben Lawers and Craig Calliach, Perthshire.

118. **PYRENULA** Ach. Lich. Univ. p. 64 (1810); emend. Massal. Ric. Lich. p. 162 (1852); Mudd Man. p. 298. (Pl. 54.)

Thallus crustaceous, superficial or developed within the substratum, not corticated. Perithecia simple, variously globose, with poriform or slightly beaked ostiole; paraphyses slender, distinct; asci 8-spored; spores elongate, 2–5-septate, the cells variously lentiform or angular in shape, brown. Spermogones with branched sterigmata and slender bent terminal spermatia.

Distinguished from *Microthelia*, which also has brown septate spores, not only by the unbranched paraphyses, but also by the form of the spores. It is largely a tropical or subtropical genus, and only a few species occur in Europe.

1. **P. nitida** Ach. Syn. Lich. p. 125 (1814).—Thallus yellowish-olive or greyish-brown, waxy, continuous, smooth, somewhat shining, sometimes traversed and intersected by blackish lines. Perithecia rather large, black, globose-hemispherical, immersed in or veiled by the thallus, the ostiole more or less protruding, depressed and umbilicate; perithecial wall entire, black; paraphyses distinct; spores ellipsoid-oblong, 3-septate, brown, each cell with an angular oil-drop, 0,020–27 mm. long, 0,007–10 mm. thick; hymenial gelatine not tinged with iodine.—Mudd Man. p. 298. *Sphæria nitida* Weigel Obs. Bot. p. 45, t. 2, fig. 14 (1772); Dicks. Plant. Crypt. Brit. 1, p. 23; With. Arr. ed. 3, iv. p. 393; Sow. Engl. Fungi, n. 275. *Verrucaria nitida* Schrad.

Journ. Bot. i. p. 79 (1801); Grev. Fl. Edin. p. 353; Borr. in Engl. Bot. Suppl. t. 2607, fig. 1; Hook. in Sm. Engl. Fl. v. p. 149; Tayl. in Mackay Fl. Hib. ii. p. 87; Leight. Angioc. Lich. p. 35, t. 15, fig. 3 & Lich. Fl. p. 447; ed. 3, p. 478; Cromb. Lich. Brit. p. 118. *V. glabrata* Carroll in Journ. Bot. iii. p. 293 (1865) (non Ach.); Cromb. Lich. Brit. p. 118 pro parte; Leight. Lich. Fl. p. 448; ed. 3, p. 479.

Exsicc. Larb. Lich. Cæsar. n. 48; Leight. n. 27; Bohl. n. 106.

The thallus is often punctuated by clear white dots, a growth character not always present. The specimens of "*V. glabrata*" collected by Carroll all belong to this species; they differ only in the absence of the white dots on the thallus.

Hab. On the bark of trees.—*Distr.* Frequent in the Channel Islands, England and Wales, somewhat rare in Scotland and Ireland. —*B. M.* Jersey; Sark; Withiel, Cornwall; near Plymouth, near Totnes and Torquay, Devon; I. of Wight; Dorset, New Forest, Hants; Arundel Park and Henfield, Sussex; Leigh Woods, Bristol, Somerset; Gosfield Hall Woods, Ulting, Massing and Great Braxted, Essex; Church Stretton, Shropshire; Harlech and Dolgelly, Merioneth; Gloddaeth near Conway and Bettws-y-Coed, Carnarvonshire; Kildale, Cleveland and Bilsdale, Yorkshire; Largo, Ayrshire; Achosragan Hill and Barcaldine, Argyll; Glen Falloch, Perthshire; Ballyedmond, Cork; Derrycuintry, Cromaglown and Torc Mts., Glencar, Killarney; Lough Inchiquin, Kerry; Glenstale, Tipperary; Tully, Connemara, Galway.

Form **elæodes** A. L. Sm.—Thallus dark blackish or purplish-brown, resembling a diffuse dark oily stain.—*Verrucaria nitida*, f. *elæodes* Leight. Lich. Fl. ed. 3, p. 479.

Hab. On old laurel and other trees.—*Distr.* Rare in N. Wales.—*B. M.* Bettws-y-Coed, Carnarvonshire.

Var. **nitidella** Mudd Man. p. 299 (1861).—Thallus thin, yellowish or brownish. Perithecia smaller than in the species, entirely immersed or more or less uncovered, the ostiole a small pore not always visible.—Var. *dermatodes* Mudd *l. c. Verrucaria dermatodes* Borr. in Engl. Bot. Suppl. t. 2607, fig. 2 (1829); Hook. in Sm. Engl. Fl. v. p. 149; Tayl. in Mackay Fl. Hib. ii. p. 87. *V. nitida* var. *dermatodes* Leight. Angioc. Lich. p. 36, t. 15, fig. 4 (1851). *V. nitida* var. *nitidella* Floerke ex Nyl. in Maine et Loire Mém. Soc. Acad. iv. p. 46 (1858); Cromb. Lich. Brit. p. 118; Leight. Lich. Fl. p. 448; ed. 3, p. 479. *V. achrospora* Nyl. in Flora l. p. 179 (1867). *V. glabratula* Nyl. tom. cit. p. 330. *V. glabrata* var. *glabratula* Carroll in Journ. Bot. v. p. 260 (1867); Cromb. Lich. Brit. p. 118; var. *dermatodes* Leight. Lich. Fl. p. 449 (1871); ed. 3, p. 480.

Exsicc. Larb. Lich. Cæsar. n. 99 & Lich. Hb. n. 359; Leight. n. 28; Baxt. Stirp. Crypt n. 73.

The perithecia are somewhat more persistently immersed than in the species; the smaller size in extreme forms represents almost a

specific divergence from the type, but in many specimens individual perithecia become larger or are more emergent.

Hab. On the bark of trees.—*Distr.* Almost coextensive but rarer than the species; not recorded from Scotland.—*B. M.* Jersey; Sark; Withiel, Cornwall; Becky Falls, Ullacombe, and Berry Castle, Totnes, Devon; Chelford, Gloucestershire; Wakehurst and Hastings, Sussex; Bagley Woods, Berks; Gloddaeth, Conway, Carnarvonshire; Bolton Woods, Lancashire; Kildale and Ayton, Cleveland, Yorkshire; Derrycuintry and Torc Mts., Cromaglown, Crogham and Muckruss Demesne, Killarney, Kerry.

119. **ANTHRACOTHECIUM** Hampe ex Massal. in Att. Ist. Venet. ser. 3, v. p. 300 (1860); A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, p. 68 (1903). (Pl. 55.)

Thallus crustaceous, superficial or developed within the substratum. Perithecia simple, scattered or coherent, more or less immersed, globose or somewhat angular with entire perithecial wall; paraphyses unbranched, free; spores 1–8 in the ascus, elongate or ellipsoid, brown, muriform, the cells containing lentiform, round or angular guttæ. Spermogones globose, small; spermatia threadlike, bent.

A corticolous, tropical and subtropical genus, with only one representative in Europe.

1. **A. hibernicum** A. L. Sm.—Thallus yellowish-olive or brownish, waxy, continuous, smooth and somewhat shining. Perithecia globose, large, black, deeply immersed in the tissue of the substratum, solitary or usually several cohering, opening by a pore, raising and splitting the thallus and cuticle; perithecial wall very thick, entire, with an inner very dark layer; paraphyses numerous, slender; asci 8-spored, the spores varying in form and size, usually ellipsoid and blunt at the ends, sometimes slightly bent, colourless, usually becoming brown, with 1–5 distinct septa and others less clearly marked, muriform, the walls between the cells swollen and indistinct, the separate cells visible only as separate globose or angular guttæ, 0,050–110 mm. long, 0,020–40 mm. thick.—*Verrucaria hibernica* Nyl. in Flora li. p. 163 (1868). *V. pyrenuloides* var. *hibernica* Carroll in Journ. Bot. vi. p. 101 (1868); Cromb. Lich. Brit. p. 118; Leight. Lich. Fl. p. 458; ed. 3, p. 490.

Considered by Nylander to be closely allied to, if not a variety of, *Verrucaria pyrenuloides* (*Trypethelium pyrenuloides* Mont. in Ann. Sci. Nat. sér. 2, xix. p. 69 (1843)), a plant of tropical and subtropical regions. It differs in the lighter-coloured thallus and somewhat in the form of the spores. I have not seen a specimen of Montagne's plant.

Hab. On hazel.—*B. M.* Torc Mt. and Eagle's Nest, Killarney, Kerry (the only localities).

Parasitic Species formerly included among lichens of the two previous Natural Orders but now classified as fungi. (*See* Trans. Brit. Mycol. Soc. iii. pp. 174–178 (1910).)

Species with brown 2-celled spores, parasitic on other lichens, belong to *Ticothecium*, now regarded as a genus of *Pyrenomycetes*. These are:—

Ticothecium gemmiferum Koerb. Parerg. p. 468 (1865); Mass. in Grevillea xvii. p. 4.—*Verrucaria gemmifera* Tayl. in Mackay Fl. Hib. ii. p. 95 (1836); Leight. Angioc. Lich. p. 47, t. 20, fig. 3 & Lich. Fl. p. 464; ed. 3, 495. *V. rugulosa* Borr. ex Leight. Angioc. Lich. p. 47, t. 21, fig. 1 & Lich. Fl. p. 440; ed. 3, p. 470? *V. Larbalestierii* Leight. in Trans. Linn. Soc. ser. 2, i. p. 242, t. 33, figs. 15–17 (1878) & Lich. Fl. ed. 3, p. 471 (spore measurements too large). *Endococcus gemmiferus* Nyl. in Maine et Loire Mém. Soc. Acad. iv. p. 64 (1858); Cromb. Lich. Brit. p. 122. *E. rugulosus* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 439 (1856); Cromb. *l. c.* *Microthelia rugulosa* Mudd Man. p. 306 (1861). *M. gemmifera* Mudd tom. cit. p. 307.

T. calcaricolum Arn. in Verh. Zool.-Bot. Ges. xxiii. p. 521 (1873); Mass. in Grevillea *l. c.*—*Microthelia calcaricola* Mudd Man. tom. cit. p. 306, t. 5, fig. 128 (1861). *Endococcus calcareus* Nyl. ex Cromb. *l. c.* *Verrucaria calcaricola* Leight. Lich. Fl. p. 464; ed. 3, p. 495.

T. perpusillum Arn. in Flora lvii. p. 27 (1874); Mass. in Grevillea *l. c.*—*Endococcus perpusillus* Nyl. in Act. Soc. Linn. Bord. sér. 3, i. p. 439 (1856); Cromb. Lich. Brit. p. 123. *Verrucaria perpusilla* Leight. Lich. Fl. p. 464; ed. 3, p. 496.

T. pygmæum Koerb. in Denkschr. Schles. Ges. Vaterl. Kultur. p. 236, t. 6, fig. 12 (1853); Mass. in Grevillea tom. cit. p. 5.—*Microthelia pygmæa* Koerb. Syst. Lich. Germ. p. 374 (1855); Mudd Man. p. 307.

Var. **ventosicola** Wint. in Rabenhorst's Krypt. Fl. i. 2, p. 349 (1887).—*Microthelia ventosicola* Mudd Man. p. 307 (1861). *Sphæria ventosaria* Lindsay in Trans. Roy. Soc. Edin. xxiv. p. 439 (1866). *Endococcus ventosus* Nyl. ex Cromb. Lich. Brit. p. 123 (1870). *Verrucaria ventosicola* Leight. Lich. Fl. p. 463; ed. 3, p. 495.

T. squamarioides Wint. in Hedw. xxv. p. 17 (1886); Mass. in Grevillea *l. c.*—*Sphæria squamarioides* Mudd Man. p. 130 (1861).

T. erraticum Massal. Symm. Lich. p. 94 (1855).—*Endococcus erraticus* Nyl. in Maine et Loire Mém. Soc. Acad. iv. p. 64 (1858); Cromb. Lich. Brit. p. 122. *Verrucaria erratica* Leight. Lich. Fl. p. 465; ed. 3, p. 496.

Subsp. **microphorum** A. L. Sm.—*Endococcus erraticus* subsp. *microphorus* Nyl. in Flora lxiv. p. 189 (1881); Cromb. in. Journ. Bot. xx. p. 276 (1882).

T. rimosicolum Arn. in Flora xliv. p 678 (1861); Mass. in Grevillea *l. c.*—*Microthelia rimosicola* Mudd tom. cit. p. 308, t. 5, fig. 129. *Verrucaria advenula* Nyl. in Flora xlviii. p. 606 (1865); Carroll in Journ. Bot. v. p. 260 (1867); Cromb. Lich. Brit. p. 121. *V. rimosicola* Leight. Lich. Fl. p. 465; ed. 3, p. 496. *V. peripherica* Tayl. in Mackay Fl. Hib. ii. p. 97 (1836)? Leight. Angioc. Lich. pp. 48 & 75, t. 21, fig. 2 & Lich. Fl. p. 449; ed. 3, p. 480? *Endococcus peripheric*us Cromb. Lich. Brit. p. 123?

T. cerinaria Berl. & Vogl. in Sacc. Syll. Add. p. 120 (1886). Mass. in Grevillea xvii. p. 5.—*Sphæria cerinaria* Mudd Man. p. 136 (1861).

Other parasitic species, with colourless simple or septate spores, now classified as pyrenomycetous fungi, are :—

Didymosphæria epipolytropa Wint. in Rabenhorst's Krypt. Flora i. 2, p. 432 (1885).—*Thelidium epipolytropum* Mudd Man. p. 298 (1861). *Verrucaria epipolytropa* Cromb. Lich. Brit. p. 121 (1870); Leight. Lich. Fl. p. 463; ed. 3, p. 494.

D. microstictica Wint. in Hedwigia xxv. p. 25 (1886).—*Verrucaria microstictica* Leight. Lich. Fl. p. 461; ed. 3, p. 493. *Exsicc.* Leight. n. 317 (as *Endocarpon microsticticum*).

D. neottizans A. L. Sm.—*Verrucaria neottizans* Leight. in Trans. Linn. Soc. ser. 2, i. p. 239, t. 32, fig. 19 (1878) & Lich. Fl. ed. 3, p. 497.

D. gelidaria A. L. Sm.—*Sphæria gelidaria* Mudd Man. p. 130 (1861). *Ticothecium gelidarium* Berl. & Vogl. in Sacc. Syll. Fung. Add. p. 118 (1886); Mass. in Grevillea xvii. p. 4.

Physalospora? psoromoides Wint. in Hedwigia xxv. p. 23 (1886).—*Verrucaria psoromoides* Borr. in Engl. Bot. Suppl. t. 2612, f. 1 (1829). *Endocarpon psoromoides* Hook. in Sm. Engl. Fl. v. p. 157 (1833); Leight. Angioc. Lich. p. 13; Mudd Man. p. 267.

Pharcidia? dubiella A. L. Sm.—*Verrucaria dubiella* Nyl. in Flora xlviii. p. 356 (1865); Carroll in Journ. Bot. iv. p. 25 (1866); Cromb. Lich. Brit. p. 115; Leight. Lich. Fl. p. 446; ed. 3, p. 477. *Verrucaria endococcoidea* Nyl. in Flora xlviii. p. 356 (1865); Carroll in Journ. Bot. iv. p. 25 (1866); Lindsay in Journ. Micros. Sci. ix. p. 351 (1869); Cromb. Lich. Brit. p. 116; Leight. Lich. Fl. p. 461; ed. 3, p. 493.

Ph.? triphractoides A. L. Sm.—*Endococcus triphractoides* Nyl. ex Cromb. in Grevillea iii. p. 24 (1874). *Verrucaria triphractoides* Leight. Lich. Fl. ed. 3, p. 497 (1879)

Massaria scoriadea Cooke in Grevillea xvii. p. 93 (1889).—*Sphæria scoriadea* Fr. El. Fung. ii. p. 87 (1828). *Verrucaria conferta* Tayl. in Mackay Fl. Hib. ii. p. 87 (1836); Leight. Angioc. Lich. p. 39, t. 17, fig. 2 fide Cooke Brit. Fungi ii. p. 873 (1871).

Muellerella polyspora Hepp ex Mueller in Mém. Soc. Phys Hist. Nat. Genève xvi. p. 420 (1862).—*Endococcus haplotellus* Nyl. in Flora l. p. 180 (1867); Carroll in Journ. Bot. vi. p. 101 (1868) (spores simple); Cromb. Lich. Brit. p. 122. *Verrucaria haplotella* Leight. Lich. Fl. p. 463 (1871); ed. 3, p. 495.

The following parasitic species has been classified as a discomycetous fungus :—

Conida punctella Arn. in Denkschr. Bot. Ges. Regensb. 1890, p. 46, previously recorded as *Arthonia punctella* Nyl. see above, p. 219.

THELOCARPACEÆ.

Horizontal thallus wanting. Algal cells *Pleurococcus* or *Protococcus*. Perithecia superficial, surrounded by a gonidial sheath, completely enclosed or opening by a pore; asci with numerous simple or septate spores.

A somewhat peculiar and aberrant Order. The single genus *Thelocarpon* was included by Nylander in the *Pyrenocarpei* (Mém. Soc. Sci. Nat. Cherb. v. p. 135 (1857)). Later it was transferred to the fungi by Rehm (Hedwigia xxx. p. 3 (1891)), who regarded it as one of the *Hypocreaceæ*. A. Zahlbruckner, who rejects this classification on account of the well-defined gonidial structure, has included it in the *Acarosporaceæ*, along with other genera distinguished by many-spored asci (see p. 107).

120. **THELOCARPON** Nyl. in Mém. Soc. Sci. Nat. Cherb. ii. p. 338 (1854), emend. in Flora lvi. p. 299 (1873). (Pl. 56.)

Thallus forming small scattered or congregate verrucæ, each one enclosing a perithecium. Perithecia almost globose, completely enclosed or opening above by a pore; perithecial wall colourless, slightly developed; paraphyses slender, simple or branched or wanting; asci elongate, clavate or ventricose-fusiform, many-spored; spores minute, colourless, simple or pseudo-septate. Spermogones unknown.

1. **Th. Laureri** Nyl. in Mém. Soc. Sci. Nat. Cherb. iii. p. 191 (1855) & in Flora xlviii. p. 261 (1865).—Thallus confined to minute scattered or aggregate verrucæ, yellowish-green. Perithecia enclosed in the verrucæ, soft, minute, globose, citrine- or greenish-yellow, the ostiole slightly depressed and inconspicuous; perithecial wall colourless; paraphyses scanty, slender, branched, shorter than the asci; asci flask-shaped, broad in the middle, narrower upwards, about 0,100 mm. long, 0,012 mm. thick; spores minute,

colourless, oblong, obsoletely guttulate at each end, 0,0025–40 mm. long, 0,0015–20 mm. thick; hymenial gelatine scarcely tinged, the asci pale-bluish, with iodine.—Leight. in Ann. Mag. Nat. Hist. ser. 3, xiv. p. 401, t. 9, ff. 1–5 (1864) & Lich. Fl. p. 407; ed. 3, p. 439; Cromb. Lich. Brit. p. 106. *Sphæropsis Laureri* Flot. in Bot. Zeit. v. p. 65 (1847).

Exsicc. Leight. n. 351; Larb. Lich. Hb. n. 357.

Hab. On old rails and on burnt ground.—*Distr.* Rare and scarce in Central England.—*B. M.* Middletown and Arkoll Hill, Shropshire.

2. **Th. intermediellum** Nyl. in Flora xlviii. p. 261 (1865).—Thallus forming small verrucæ, yellowish-green. Perithecia minute, globose, enclosed in the verrucæ, depressed at the ostiole; paraphyses absent; asci broad towards the middle, tapering upwards; spores minute, oblong, guttulate at each end, 0,0035–50 mm. long, 0,002 mm. thick; hymenial gelatine tawny-wine-red, the asci faintly bluish, with iodine.—Phillips in Grevillea ii. p. 125, t. 21; Leight. Lich. Fl. ed. 3, p. 439.

Distinguished from the preceding species by the somewhat large size of the perithecia and the absence of paraphyses. I have given the size of the spores as recorded by Phillips, but in the specimens examined they are constantly smaller, measuring about 0,002·3 mm. long, 0,0015·20 mm. thick. Nylander calls attention to the periphyses, fasciculate filaments which occur near the ostiole and replace the paraphyses.

Hab. On rotten wood and old leather.—*B. M.* Near Shrewsbury, Shropshire.

3. **Th. superellum** Nyl. in Flora xlviii. p. 261 (1865).—Thallus in scattered verrucæ, greenish-yellow. Perithecia small, globose, the ostiole subconical; paraphyses very abundant, straight, slender and thread-like; asci tapering upwards; spores ellipsoid, 0,009–12 mm. long, 0,0040–45 mm. thick; hymenial gelatine not tinged, the asci bright-blue, with iodine.—Leight. in Grevillea iii. p. 116 & Lich. Fl. ed. 3, p. 440; Cromb. in Journ. Bot. xiii. p. 142 (1875).

Externally not unlike the two preceding species though the perithecia are slightly larger and not depressed above. The paraphyses are markedly dissimilar, and the spores larger.

Hab. On earth and decaying hepatics, rare.—*B. M.* Trefriw, Carnarvon.

4. **Th. epithallinum** Leight. in Ann. Mag. Nat. Hist. ser. 3, xviii. p. 24 (1866); Nyl. in Flora xlix. p. 420 (1866).—Thallus in scattered verrucæ, yellowish-green. Perithecia globose, minute; paraphyses stouter than in the preceding species, rather short and unbranched; asci elongate, linear-cylindrical; spores oblong or cylindrical-oblong, 0,006–7 mm. long, 0,0020–25 mm. thick;

hymenial gelatine not tinged, the asci tawny-reddish with iodine. —Cromb. Lich. Brit. p. 107; Leight. Lich. Fl. p. 407; ed. 3, p. 439. Specimen not seen.

Allied to the Lapland species, *Th. epibolum* Nyl. *l. c.*, but differing in the slightly larger spores and stouter paraphyses. Leighton referred to it in Ann. Mag. Nat. Hist. ser. 3, xiv. p. 402 (1864), but did not then discriminate between it and *Th. Laureri*.

Hab. Parasitic on the thallus of *Bœomyces rufus* in an upland hilly district (Stiperstones Hill, Shropshire).

TRYPETHELIACEÆ.

Thallus crustaceous, not corticated, superficial or developed under the bark (*hypophlœodal*), sometimes almost obsolete. Algal cells (*gonidia*) *Trentepohlia*. Perithecia united in a stroma, each with a separate ostiole; spores 2–8 in the ascus, septate, colourless or brown.

The Order is well represented in tropical and subtropical regions; there is only one British genus.

121. **MELANOTHECA** Fée Ess. Crypt. Suppl. p. 70 (1837); emend. Nyl. in Maine et Loire Mém. Soc. Acad. iv. p. 69 (1858). (Pl. 57.)

Thallus forming spots on the substratum or scarcely visible. Perithecia several confluent in a stroma, the inner dividing walls more or less distinct, the upper common wall black; paraphyses present, confused or distinct; asci usually 8-spored; spores elongate, 1- many-septate, colourless or coloured.

Mueller-Argau (in Engl. Bot. Jahrb. vi. p. 376 (1885)) has limited the genus to include only species with coloured spores. As here understood it includes species with spores either colourless or coloured.

1. **M. gelatinosa** Nyl. in Mém. Soc. Sci. Nat. Cherb. v. pp. 140, 145 (1857), emend.—Thallus forming pale or brown spots on the bark, usually determinate with a dark line at the circumference. Perithecia many in a roundish flat black stroma, dotted with the ostioles; perithecial walls brownish or almost colourless, not distinct at the base; paraphyses indistinct, somewhat crushed; asci obpyriform; spores oblong-ellipsoid, blunt at the ends, colourless becoming brownish, 0,023–27 mm. long, 0,007–·010 mm. thick; hymenial gelatine not tinged, the asci yellowish-red, with iodine.—Jones in Proc. Nat. Hist. Soc. Dublin 1864, p. 129; Cromb. Lich. Brit. p. 123; Leight. Lich. Fl. p. 466; ed. 3, p. 498. *Arthonia gelatinosa* Chev. in Journ. Phys. Chim. Hist. Nat. Paris xciv. p. 54 (1822).

Exsicc. Mudd n. 232 & Leight. nos. 223 (as *Arthonia puncti-*

formis var. *olivacea* Ach.), 358 (as *O. punctiformis* var. *galactina*); Larb. Lich. Hb. n. 40.

Similar in outward appearance to *M. arthonioides* Massal., a continental plant, but differing in the lighter coloured walls of the perithecia, the less distinct paraphyses and larger spores. The latter are at first colourless and 1-septate, becoming brownish and 3-septate.

Hab. On the smooth bark of trees.—*Distr.* Frequent throughout Great Britain and Ireland, rare in the Channel Islands.—*B. M.* Withiel, Cornwall; near Becky Falls, Torquay and Cornwood, Devon; near Handcross, near Balcombe, Newtimber, Tilgate and Tonbridge Wells, Sussex; Hailey Wood and Chedworth Wood, Gloucestershire; Stableford and Church Stretton, Shropshire; Dolgelly, Merioneth; Dolbadarn Castle, Llanberis and Conway Falls, Carnarvonshire; Baysdale and near Ayton, Cleveland, Yorkshire; Appin, Argyll; Glen Lochay, Killin and Blair Athole, Perthshire; Glen Cluny, Braemar, Aberdeenshire; Glen Nevis, Invernessshire; Ballyedmond and Riverstown, Cork; by Glenmore Lake, Kerry; Glenstale, Tipperary; Kylemore, Connemara, Galway; Deer Park, Glenarm, Antrim.

2. **M. diffusa** Leight. Lich. Fl. p. 467 (1871).—Thallus forming effuse greyish spots. Perithecia several in irregularly round or oblong stromata; perithecial walls colourless; paraphyses stoutish rather crushed; spores linear-oblong, smoky-brown, 1-septate, slightly constricted, 0,022–26 mm. long, 0,005 mm. thick.—Cromb. in Journ. Bot. ix. p. 179 (1871); Leight. op. cit. ed. 3, p. 498.

Hab. On the bark of young trees.—*Distr.* Rare in N. Wales.—*B. M.* Nant Gwynant, Snowdon, Carnarvonshire.

3. **M. ischnobela** Nyl. in Flora lix. p. 238 (1876).—Thallus whitish, forming rather large effuse spots. Stromata small, scattered, somewhat convex; perithecia 2–4 in each stroma, perithecial walls dimidiate, black; paraphyses slender, numerous; asci cylindrical; spores 8 in the ascus, acicular, multi-guttulate and 1-multi-pseudo-septate, 0,060–115 mm. long, 0,001–2 mm. thick.—Cromb. in Journ. Bot. xiv. p. 363 (1876); Leight. Lich. Fl. ed. 3, p. 499. *Verrucaria myriospora* Leight. in Trans. Linn Soc. ser. 2, i. p. 145, t. 22, figs. 1–3 (1876).

Exsicc. Larb. Lich. Hb. n. 80.

Distinguished by the smaller stromata and by the acicular, colourless spores.

Hab. On holly.—*B. M.* Kylemore, Connemara, Galway (the only locality).

MYCOPORACEÆ.

Thallus crustaceous not corticated, superficial or developed within the bark (*hypophlœodal*). Algal cells *Palmella* or *Trentepohlia*. Perithecia compound, several united in a common

outer dark-coloured wall (*peridium*), but with separate ostioles; spores 6–8 in the ascus, variously septate, colourless or coloured.

A small Order represented in Great Britain by four species in two genera:—

Algal cells *Palmella*..... 122. **Mycoporum.**
Algal cells *Trentepohlia* ..... 123. **Mycoporellum.**

122. **MYCOPORUM** Flot. ex Nyl. in Mém. Soc. Sci. Nat. Cherb. iii. p. 186 (1855). (Pl. 58.)

Thallus thin or obsolete. Algal cells *Palmella*. Perithecia compound with a dark-coloured outer wall (*peridium*), the different hymenia not distinctly separated; asci elongate or pyriform-ellipsoid; paraphyses entangled or disappearing; spores 6–8 in the ascus, colourless or becoming dark-coloured, variously septate or muriform.

1. **M. miserrimum** Nyl. in Mém. Soc. Sci. Nat. Cherb. v. p. 145 (1857).—Thallus very thin, indicated by a pale spot, or obsolete. Perithecia 2–6-compound; the outer peridium small, black, nodulose with the ostioles of the enclosed perithecia; perithecial walls dark below, indistinct laterally; paraphyses crushed, almost disappearing; asci broadly ellipsoid; spores 8 in the ascus, oblong, 3–5-septate with 1 or 2 longitudinal divisions, colourless, becoming brownish, 0,015–18 mm. long, 0,005–8 mm. thick.—Carroll in Journ. Bot. iii. p. 292 (1865); Cromb. Lich. Brit. p. 106; Leight. Lich. Fl. pp. 406, 485; ed. 3, p. 438.

Exsicc. Mudd n. 231 (as *Arthonia punctiformis*).

Hab. On smooth bark of trees.—*Distr.* Not uncommon in England and Wales.—*B. M.* Ullacombe, Devon; Polegate, Sussex; Chedworth Wood and Hailey Wood near Cirencester, Gloucestershire; Pontesford, Shropshire; Nannau, Dolgelly, Merioneth; Hoggart's Wood, Ingleby and near Guisboro, Cleveland, Yorkshire.

2. **M. ptelæodes** Nyl. Lich. Scand. App. p. 291 (1861).—Thallus forming pallid spots or obsolete. Perithecia united in small scattered peridia, the upper wall black, the basal wall scarcely developed; paraphyses scanty, disappearing; spores 8 in the ascus, ovoid-ellipsoid, 3-septate, usually with one longitudinal septum, colourless, 0,012–16 mm. long, 0,006–8 mm. thick.—Cromb. in Journ. Bot. xiv. p. 363 (1876); Leight. Lich. Fl. ed. 3, p. 438.

Closely allied to the preceding, but with a less developed basal wall and shorter spores.

Hab. On trees (alder).—*Distr.* Rare in W. England.—*B. M.* Cleve Hill, Cheltenham, Gloucestershire.

123. **MYCOPORELLUM** A. Zahlbr. in Engler & Prantl Pflanzenf. i. 1*, p. 78 (1903). (Pl. 59.)

Thallus crustaceous, thin or obsolete. Algal cells *Trentepohlia*. Perithecia compound with a dark-coloured outer wall (*peridium*), the different perithecia not distinctly separated; asci ellipsoid: paraphyses scanty or wanting; spores 8 in the ascus, elongate, septate, colourless or brownish.

1. **M. obscurum** A. L. Sm.—Thallus thin, forming spots on the bark. Perithecia compound, thickly scattered over the bark, orbicular or angular; the outer peridial wall developed over the top, black, the lower wall colourless; perithecial walls indistinct; paraphyses scanty, indistinct; spores 8 in the ascus, oblong-clavate, 3-septate, halonate, the upper cell slightly larger, 0,015 mm. long, 0,005 mm. thick.—*Opegrapha obscura* Pers. in Ust. Ann. Bot. vii. p. 32, t. 3, fig. 5, B (1794); *O. atra* var. *obscura* Schær. Enum. p. 155 (1850); Leight. in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 441, t. 8, fig. 37 (1854). *Mycoporum obscurum* Almq. in K. Svensk. Vet.-Akad. Handl. xvii. n. 6, p. 8 (1880).

Hab. On bark of trees.—*B. M.* Will's Braes, Forfar.

2. **M. sparsellum** A. L. Sm.—Thallus white, thin, determinate. Perithecia compound, enclosed in a black prominent rugose roundish or irregular peridium, colourless below; paraphyses indistinct; spores 8 in the ascus, ovoid, colourless or faintly smoky-brown, 1-septate, rounded at the ends, slightly constricted, 0,013–22 mm. long, 0,007–10 mm. thick.—*Mycoporum sparsellum* Nyl. in Flora xlvii. p. 618 (1864) & in Ann. Sci. Nat. sér. 5, viii. p. 343 (1867); Carroll in Journ. Bot. vi. p. 101 (1868); Cromb. Lich. Brit. p. 106; Leight. Lich. Fl. p. 405; ed. 3, p. 437.

Recorded with several other tropical and sub-tropical species only from S.W. Ireland. The thallus of Lindig's specimen from New Granada contains *Trentepohlia* algæ, which, along with the septate spores, indicates its position in *Mycoporellum*.

Hab. On holly.—*Distr.* Rare in S.W. Ireland (Cromaglown. Killarney).

There are a number of specimens in the British Museum classified under the genera *Lepraria* Ach. (Lich. Suec. Prod. p. 5 (1798)), *Spiloma* Ach. (Meth. p. 9 (1803)), and *Byssus* Mich. (Nov. Plant. Gen. p. 210 (1729)), which have been specifically determined by their collectors. These genera and species, generally accepted by older lichenologists, are the early or imperfect conditions of crustaceous lichens, or sometimes of algæ or fungi, most of them indeterminable. They grow usually in moist or shady situations that favour irregular growth, while retarding the normal development of thallus and fruit.

ADDENDA

Part i. p. 88, *after* **C. phæocephalum.**

Calicium roscidum Floerke Deutsche Lich. 3, p. 1 (1815); Nyl. Syn. Lich. p. 153 (1858–60).—Thallus ashy-grey, thin or almost obsolete. Apothecia moderate in size, blackish; stalk black, rather short and stout; capitulum lentiform, the margin or the entire head greenish-yellow-pruinose; spores brown or blackish, fusiform-ellipsoid, 1-septate, slightly constricted at the septum, brownish or blackish, 0,009–018 mm. long, 0,004–8 mm. thick. —*Calicium hyperellum* var. *roscidum* Ach. Syn. p. 59 (1814).

Approaches *C. phœocephalum* in the size and appearance of the apothecia, but easily distinguished by the form of the spores.

Hab. On oak bark.—*B. M.* Lowther Park, Westmoreland (communicated by J. A. Martindale).

Part i. p. 128, *after* **C. alcicornis.**

Cladonia luteoalba Wils. & Wheld. Trans. Liverp. Bot. Soc. i. p. 7. (1909).—Thallus macrophylline, lobes 5–10 mm. long, irregularly crenate, yellowish-green above (becoming blackish-green with age), pallido-sulphureous beneath, their apices and sometimes their lateral margins strongly incurved when dry (as in *C. alcicornis*) showing the pulverulent under surface and rendering the leaflets concave. Podetia rare, only once seen, short (3–5 mm.), cylindrical, from the surface of the leaflets, scyphiferous, scyphi hardly dilated, bearing small marginal discrete scarlet apothecia. The chemical reactions of the upper face are indistinct (Kf, C−). The yellow colour of the under face becomes much deeper on applying caustic potash and the immediate application of $CaCl_2$ still further intensifies it until it is of a deep orange-yellow.—See also Journ. Bot. xlvii. p. 324 (1909).

Hab. On old mosses in high altitudes.—*B. M.* Graygarth Fell, Lancashire.

Part i. p. 177, *after* **C. sylvatica.**

Cladina impexa Harm. Lich. France, p. 232 (1907).—Distinguished by the author from *C. sylvatica* by the more swollen main stalks or podetia, the whitish-coloured and sometimes almost translucent appearance of stalks and branches and

by the more spreading tips. Harmand cites as important the presence in older specimens of white scurfy dots on the podetia, due to the breaking up of the external cortex, a character which is also found in *C. rangiferina* and *C. sylvatica*. *C. impexa* is probably a growth form of the latter.

Hab. On bare or mossy soil, &c., chiefly in upland regions.—*B. M.* Killinster Moss, Caithness (collected and determined by D. Lillie).

Part i. p. 327, *after* **G. proboscidea.**

Gyrophora spodochroa Ach. Meth. p. 108 (1803).—Thallus colourless, ashy-grey or brownish-grey, monophyllous, rigid, moderate in size or large, below pallid-grey, brownish or brownish-black, minutely granular areolate, more or less hirsute and fibrillose. Apothecia plane or somewhat convex, the gyrose lines almost obsolete, unequally papillate with one larger central papilla ; spores variable, colourless, then brown, ellipsoid, simple, rarely becoming septate, 0,018–29 mm. long, 0,010–18 mm. thick.—*Umbilicaria spodochroa* Hoffm. Deutsch. Fl. p. 113 (1795).

Hab. On rocks.—*B. M.* Lower crags of Langdale Pikes, Westmoreland (collected and determined by J. A. Wheldon and A. Wilson).

Part i. p. 403, *after* **L. isidioides.**

Lecanora mougeotioides Nyl. in Flora lv. p. 364 (1872).—Thallus greenish-yellow or straw-coloured, closely adpressed, radiate-squamulose at the circumference, areolate and warted in the centre with a black prominent hypothallus. Apothecia somewhat depressed, black with a yellowish margin ; spores ellipsoid, 1-septate, dark-brown, 0,010–13 mm. long, 0,005–6 mm. thick.—Bloomfield in Journ. Bot. xlviii. p. 141 (1910).

Determined by A. Zahlbruckner (Engler & Prantl Pflanzenf. i, 1*, p. 233 (1907)) as a species of *Rinodina* on account of the 2-celled brown spores, and as synonymous with *R. oreina* Wainio (*Lecanora oreina* Ach. Syn. p. 181 (1814)). Nylander considered it a distinct species on account of the reaction with caustic potash which, in *R. oreina*, gives no coloration, while in *L. mougeotioides* there is a distinct yellowing of the surface and medulla of the thallus.

Hab. On rocks, Fairlight Undercliff, Sussex.

Part ii. p. 49, *after* **L. rubidula.**

Lecidea pleiospora A. L. Sm. in Journ. Bot. xlix. p. 41, t. 510, fig. 1 (1911).—Thallus thin, greenish, indistinct, consisting of a confused layer of fungal hyphæ and algæ. Apothecia minute, about 0,250 mm. in diameter, immarginate, blackish-brown, internally reddish ; hypothecium narrow, brownish-red ; epithecium brownish-red ; paraphyses few, slender, conglutinate, scarcely visible ; asci oblong-clavate, about 0,075 mm. long, 0,012 mm. wide, 12–18-spored ; spores globose or slightly irregular in size and form, colourless with a distinct

epispore, 0,006–8 mm. in diameter; hymenial gelatine blue then sordid wine-red with iodine.

Belongs to the *Biatora* section of *Lecideæ*, and from the description of *Lecidea rubidula* is allied to that species. The excessive number of spores is constant in the apothecia examined.

Hab. On the soil in a disused clay-pit.—*B. M.* Little Bowden, Northamptonshire (collected by H. P. Reader).

Part ii. p. 75, *after* **L. lapicida.**

Lecidea declinascens Nyl. in Flora lxi. p. 243 (1878).—Thallus ashy-greyish, deeply cracked-areolate, the areolæ contiguous or dispersed. Apothecia black, at first plane and marginate, often confluent, becoming turgid and immarginate; hypothecium dark-brown; paraphyses slender, non-septate, dark-bluish-green at the tips; spores ellipsoid-oblong, small, 0,010–14 mm. long, 0,005–6 mm. thick; hymenial gelatine blue with iodine.

Differs from *L. lapicida* var. *declinans* Nyl. in the non-septate paraphyses. The specimen sent by J. A. Martindale was determined by Nylander.

Hab. On rocks.—*B. M.* Red Screes, Westmoreland.

Part ii. p. 109, *after* **B. resinæ.**

Biatorella campestris Th. Fr. Gen. Heterolich. p. 86 (1861) & Lich. Scand. p. 398.—Thallus scanty, granular or none proper. Apothecia small, waxy, scattered, sessile, closed then open, marginate, becoming flat or convex, reddish flesh-coloured, the margin disappearing; paraphyses slender, septate, colourless, somewhat bent and swollen at the tips; asci elongate-cylindrical, or clavate, thick-walled, about 0,090–120 mm. long, 0,015–18 mm. thick or longer and narrower; spores, many in the ascus, cylindrical, straight, 0,007–8 mm. long or rather longer, 0,003 mm. thick.

Hab. Among mosses, and growing over *Nostoc* or soil.—*B. M.* Braunton Beacon, Devon (collected by E. M. Holmes).

Part ii. p. 214, *under* **Arthonia pruinata.**

Inoderma byssacea S. F. Gray, Nat. Arr. i. p. 498 (1821).—"Thallus rather leprous, cobwebby, dirty-white; apothecia very small, nearly globular, half-sunk, pierced, inside black."—*Sphæria byssacea* Weig. Obs. Bot. p. 42, t. 2, fig. 9 (1772).

Considered by Nylander (Flora xxxviii. p. 297 (1855)) as the spermogones of *Arthonia pruinosa* (*A. pruinata*); by Almquist (K. Svensk. Vet.-Akad. Handl. xvii. n. 6, p. 25 (1880)) as *Arthonia byssacea*; and by Arnold (Flora lxvii. p. 594 (1884)) as belonging to *Lecanactis byssacea.*

Hab. On the trunks of trees.

Part ii. p. 308, *under* **Gongylia viridis.**

After G. viridis A. L. Sm. *add* in Journ. Bot. xlix. p. 42, t. 510, f. 2 (1911). *After* the description *add* spore size up to 0·085 mm. long, and *under* Hab. *add* Theydon Bois and near Loughton, Epping Forest, Essex.

Part i. p. 467, *after* **L. cinerea.**

Lecanora (Aspicilia) Lilliei B. de Lesd. in Bull. Soc. Bot. France, liii. p. 515 (1906).—Thallus tartareous, about 0·5 mm. thick, cracked-areolate, white, yellow within (K−, CaCl−). Apothecia minute, black, immersed in the areolæ, rounded-difform, or lirellæform; epithecium olivaceous, hypothecium colourless; paraphyses gelatinous-concrete; asci narrowly clavate; spore 4–6næ, ellipsoid, 0,013–15 mm. long, 0,005–6 mm. thick; hymenial gelatine deep blue with iodine. Specimen not seen.

Outwardly like *Lecanora cinerea*, but differing in the yellow colour of the interior of the thallus and in the smaller spores.

Hab. On granitic rocks, Ousdale, Caithness. (Collected by D. Lillie.)

Part ii. p. 218, *after* **A. lapidicola.**

Arthonia Lilliei B. de Lesd. in Bull. Soc. Bot. France, lvii. p. 34 (1910).—Thallus blackish, leprose, scanty. Apothecia black, minute, about 0·1–0·2 mm. in diameter, round, plane; epithecium olivaceous, hymenium colourless or faintly brownish, hypothecium colourless; paraphyses concrete, free and capitate at the tips; asci ventricose; spores 8næ, colourless, oblong or ellipsoid, 1-septate, the two cells equal, scarcely constricted, 0,010–12 mm. long, 0,004–5 mm. thick; hymenial gelatine wine-red with iodine. Specimen not seen.

Hab. On siliceous rocks, Achastle, Caithness. (Collected by D. Lillie.)

The position of the following species is uncertain:—

Botrydina vulgaris Bréb. ex Meneghini in Mem. R. Accad. Sci. Torino, ser. 2, v. p. 98 (1842); emend. Acton in Ann. Bot. xxiii. p. 579 (1909).—Thallus forming small green spherical mucilaginous bodies 0,020–300 mm. in diameter, rarely larger, with a central mass of green algal cells (*Coccomyxa subellipsoidea* Acton, tom. cit. p. 573) and a pseudo-parenchymatous envelope of fungal cells which proliferate inwardly among the algæ. Fruit not developed. Specimen not seen.

Considered by E. Acton to be a primitive lichen distinguished from mere *soredia* by the structure of the fungal envelope. The fungus, when grown in a separate culture, developed coiled branches which suggested affinities with the *Helicosporeæ*.

Hab. Among bryophytes on rocks or on the ground, in damp shady situations, chiefly in mountainous districts.

GLOSSARY

ABRADED (Lat. *abrado*, to rub away), rubbed or scraped off.
ACERVULATE (Lat. *acervus*, a heap), heaped up—ACERVULI.
ACICULAR (Lat. *acus*, a needle), slender, needle-shaped.
ACUMINATE (Lat. *acumen*, a point), coming gradually to a point.
ADNATE (Lat. *adnascor*, to grow to), adhering to anything.
ADPRESSED (Lat. *ad*, to, *pressus*, kept under), lying flat.
ADSPERSED (Lat. *adspersus*), scattered.
ÆRUGINOSE (Lat. *ærugo*, the rust of brass), blue-green colour of verdigris.
AFFIXED, fixed to or upon.
AGGLUTINATE (Lat. *agglutino*, to glue on to), glued together.
AGGREGATE (Lat. *aggregatus*, assembled), crowded together but not confluent.
ALECTORIOID, like the genus *Alectoria*.
ALGOID, similar to algæ.
AMPHITHECIUM (Gr. *amphi*, around, *theke*, a case), the thalline margin of the apothecium, *cf.* thalloid exciple.
AMYLACEOUS (Gr. *amylon*, fine flour), starchy.
ANAPHYSES (Gr. *ana*, up, *phusis*, growth), peculiar sterigmatoid filaments in the apothecium of *Ephebeia*.
APICULATE (Lat. *apex*, the end or point), terminating in a small point.
APICULUS (Lat., a little point), a sharp, short point.
APOTHECIUM (Gr. *apo*, up, *theke*, a case), an open or disc-shaped fructification.
APPENDICULATE (Lat.), with small appendages.
APPRESSED, *cf.* adpressed.
APPLANATE (Lat. *ad*, to, *planatus*, made flat), flattened or horizontally expanded.
ARACHNOID (Gr. *arachne*, a spider), like a spider's web.
ARCUATE (Lat. *arcus*, a bow), bent like a bow, curved.
ARDELLÆ (Gr. *ardo*, to sprinkle), the small spot-like apothecia of *Arthoniaceæ*.
AREOLA (Lat. *area*, a space), a small space marked out on the surface of crustaceous lichens.
ARTHONIOID, applied to apothecia like those of the genus *Arthonia*.
ARTHROSTERIGMA (Gr. *arthron*, a joint, *sterigma*, a prop), septate sterigmata.
ARTICULATE (Lat. *articulus*, a joint), septate.
ASCUS (Gr. *askos*, a wine skin), an enlarged cell in which the spores are developed, usually the terminal end of a hypha.
ASCYPHOUS (Gr. *a*, without, *skuphos*, a cup), without scyphi, *q.v.*
ASPERSED, *cf.* adspersed.
AXIL (Lat. *axilla*, the arm-pit), the angle between the axis and any organ arising from it.
AXIS (Lat., an axle), the central strand of tissue or the main stalk round which the organs are developed.

BACILLAR (Lat. *bacillum*, a staff), rod- or club-shaped.
BADIO-, BADIOUS (Lat.), chestnut-brown.
BÆOMYCETOID, like the genus *Bæomyces*.
BIATORINE, with soft or waxy apothecia, often brightly coloured, without a thalline margin, as in *Biatora*.

Bifid (Lat. *bis*, twice, *findo*, *fidi*, *findere*, to cut), divided in two.
BiloculAR (Lat. *bi-*, *bis-*, twice, *loculus*, a compartment), having two cells.
Biseriate (Lat. *bi*, twice, *series*, a succession), in two rows.
Botryose (Gr. *botrus*, a bunch of grapes), branched like a cluster of grapes.
Bullate (Lat. *bulla*, a bubble), blistered or puckered.
Byssine, Byssoid (Lat., *byssus*, fine flax), like the old genus *Byssus*, slender and thread-like.

Cæsious (Lat.), bluish-grey.
Cæspitose (Lat. *cæspes*, a sod), growing in tufts.
Canaliculate (Lat. *canaliculus*, a small channel), with a longitudinal channel or furrow.
Cancellate (Lat.), latticed.
Capillary (Lat. *capillus*, a hair), slender and hair-like.
Capitate (Lat. *caput*, head), formed into or having a head.
Capitulum, fructification of *Caliciei*, a globose apical apothecium.
Carbonaceous (Lat. *carbo*, charcoal), black, like charcoal.
Cariose, Carious (Lat.), rotten, decayed.
Carioso-cancellate, becoming latticed by decay.
Carneous (Lat. *caro*, *carnis*, flesh), flesh-coloured.
Cartilaginous (Lat. *gristly*), hard and tough like a cartilage or sinew.
Cephalodia (Gr. *kephale*, a head), abnormal developments upon or within the lichen-thallus, usually inducing irregular outgrowths which contain a blue-green alga.
Cephalodine (Gr. *kephale*, a head), forming a head or cephalodium.
Ceranoid (Gr. *keras*, a horn, *eidos*, like), having horn-like branches.
Cervine (Lat. *cervus*, a stag), dark-tawny in colour.
Chondroid (Gr. *chondros*, cartilage), hard and tough, like cartilage, applied to a closely compact medulla, with the hyphæ arranged longitudinally and cohering to form a solid axis.
Chroolepoid, like the genus *Chroolepis* (*Trentepohlia*), with yellow gonidia.
Chrysogonidia (Gr. *chrysos*, gold, *gone*, offspring), yellow-coloured algal cells belonging to the genus *Trentepohlia*.
Cilium (Lat., an eyelash), marginal hair on thallus or fruits—Ciliate.
Cinnabarine (Gr. *kinnabari*, a red pigment), scarlet-coloured.
Citrine (Lat. *citrus*), greenish or lemon-yellow.
Clavate (Lat. *clavus*, a club), club-shaped, enlarging upwards.
Coarctate (Lat. *coarctatus*, strangled), constricted.
Colliculose (Lat. *colliculus*, a little hill), covered with little round elevations.
Complanate (Lat. *complanatus*, levelled), flattened, compressed.
Complicate (Lat.), folded together.
Concatenate (Lat. *con*, together, *catena*, a chain), joined together like the links of a chain.
Conceptacle (Lat. *conceptaculum*, a receptacle), a cavity within which reproductive cells are produced.
Concolorous, similar in colour.
Concrescent (Lat. *concresco*, to grow together), growing together.
Concrete (Lat. *concretus*, grown together), closely adhering.
Conglomerate (Lat. *con*, together, *glomus*, a ball), clustered.
Conglutinate (Lat. *conglutino*, to glue), glued together.
Connate (Lat. *connatus*, born at the same time), growing together.
Connivent (Lat. *connivens*, winking), coming into contact, converging.
Constipate (Lat.), crowded together.
Contiguous (Lat. *contiguus*, adjoining), the separate parts of the thallus touching and continuous.
Continuous, having an unbroken surface.
Convolute (Lat.), rolled round.
Coralloid (Lat. *corallum*, coral), of a coral-like structure.

CORIACEOUS (Lat. *corium*, leather), leathery.
CORNEOUS (Lat. *cornu*, a horn), horny.
CORNICULATE, CORNUTE, horn-shaped.
CORONATE (Lat. *corona*, a crown), formed like a crown.
CORRUGATE (Lat.), wrinkled, rough with wrinkles.
CORTEX (Lat., bark or rind), the outer layer of the thallus—CORTICAL, CORTICATE.
CORTICOLOUS (Lat. *cortex*, the bark, *colo*, to inhabit), living on the bark of trees.
CORYMBOSE (Gr. *korumbos*, a cluster of fruit or flowers), arranged in clusters.
COSTATE (Lat. *costa*, a rib), ribbed.
CRENATE, CRENULATE (Lat. *crena*, a notch), scalloped or with rounded notches on the margin.
CRISPATE (Lat. *crispus*, curled), curled and twisted.
CRISTATE (Lat. *crista*, a crest or terminal tuft), crested.
CRUSTACEOUS (Lat. *crusta*, rind or shell), hard, thin, brittle; applied to a closely adhering thallus without cortical layers.
CUCULLATE (Lat. *cucullus*, a hood), hooded or hood-shaped.
CUPULAR (Lat. *cupula*, a little cup), cup-shaped—CUPULE.
CYATHOID (Gr. *kuathos*, a wine cup, *eidos*, like), cup-shaped.
CYLINDRICAL (Gr. *kulindros*, a cylinder), elongate and circular in cross-section.
CYPHELLA (Gr. *kuphella*, the hollows of the ears), a minute cup-like hollow on the under-surface of the thallus of *Stictei*—CYPHELLATE.

DACTYLINE, DACTYLOID (Gr. *dactylos*, a finger), spreading like fingers.
DECOLORATE (Lat.), colourless.
DECUMBENT (Lat., reclining), reclining, but ascending at the apex.
DECUSSATE (Lat. *decusso*, to divide crosswise), of the thallus divided and crossed by dark lines.
DEHISCENT (Lat. *dehisco*, to split open), ruptured or split open.
DENDRITIC, DENDROID (Gr. *dendron*, a tree), having a branched appearance.
DENIGRATE (Lat.), blackened.
DENTATE (Lat. *dens*, a tooth), toothed at the margin.
DENUDATE (Lat.), stripped, made bare or naked.
DEPAUPERATE (Lat.), impoverished as if starved.
DEPLANATE (Lat.), flattened or expanded.
DETERMINATE (Lat., bounded), with a definite outline.
DICHOTOMOUS (Gr. *dichotomeo*, to cut in two), forked.
DIFFORM (Lat. *dis*, apart, *forma*, shape), of unusual form.
DIFFRACT (Lat., broken), broken into areolæ.
DILACERATE (Lat.), torn asunder.
DIMIDIATE (Lat. *dimidiatus*, halved), applied to the perithecial wall when it covers only the upper half of the perithecium.
DIŒCIOUS (Gr. *dis*, two, *oikos*, a house), having the male and female organs on different individuals.
DIRINEAN, similar to the genus *Dirina*.
DISCOID (Gr. *diskos*, a quoit, *eidos*, like), disc-like.
DISCOLOROUS, of a different colour.
DISCRETE (Lat. *discretus*), separate and distinct.
DISSECTED (Lat. *dissectus*, cut up), deeply divided.
DISTICHOUS (Gr. *distichos*, of two rows), disposed in two rows.
DIVARICATE (Lat., spread asunder), spreading in opposite directions.

E, Latin prefix, usually signifying without, as epruinose, esquamulose, efoliolose.
EFFIGURATE (Lat. *e*, out of, *figura*, a figure), having a distinct form or figure.
EFFUSE (Lat. *effusus*, poured out), spread out in an indeterminate way.

ELLIPTICAL, ELLIPSOID, shaped like an ellipse; oblong with rounded ends.
EMARGINATE (Lat. *emargino*, to deprive of its edge), having a notch cut out.
ENDEMIC (Gr. *en*, in, *demos*, a country district), confined to a given region.
ENDOCARPOID, applied to perithecia which are sunk in the substance of the thallus as in *Endocarpon*.
EPIPHLŒODAL (Gr. *epi*, upon, *phloios*, bark), applied to the thallus when growing on the outside of the bark.
EPISPORE (Gr. *epi*, upon, *spora*, seed), the outer spore-coat.
EPITHALLINE, applied to a spuriously thalline apothecial margin.
EPITHECIUM (Gr. *epi*, upon, *theke*, a case), the layer covering the thecium or hymenium.
ERODED, EROSE (Lat. *erosus*, gnawed), as though bitten or gnawed.
ERUMPENT (Lat. *e*, out of, *rumpere*, to break), immersed then bursting outwards.
EUGONIDIA (Gr. *eu*, well, *gonos*, offspring), bright-green gonidia (*Chlorophyllaceæ*).
EVERNIIFORM, like the genus *Evernia* (with a strap-shaped thallus).
EXASPERATE (Lat. *exaspero*, to make rough), rough with hard projecting points.
EXCIPLE, EXCIPULUM (Lat. *excipula*, a basin), term used for the hypothecium or for that part of the thallus in which the fruit is embedded (receptacle), or for the tissue surrounding the fruit.
EXPLANATE (Lat. *explanatus*), spread out.

FARINACEOUS, FARINOSE (Lat. *farina*, meal), with a mealy surface.
FASCICULATE (Lat. *fascis*, a bundle), growing in a close bundle or cluster.
FASTIGIATE (Lat. *fastigium*, a slope or gable), with branches parallel, clustered and erect, sometimes decreasing in height outwards like the gable of a house.
FATISCENT (Lat. *fatisco*, to open in chinks), cracked or falling apart.
FAVEOLÆ, FAVEOLATE (Lat. *favus*, a honeycomb), honey-combed.
FERRUGINOUS (Lat. *ferrum*, iron), rust-coloured.
FIBRILLÆ (Lat. *fibra*, a fine thread), minute fibre-like branches—FIBRILLOSE.
FILAMENTS (Lat. *filum*, a thread), thread-like constituents of the thallus—FILAMENTOUS, FILIFORM.
FIMBRIATE (Lat.), fringed.
FISTULOSE (Lat. *fistula*, a pipe), hollow.
FLACCID (Lat. *flaccidus*), flabby, limp.
FLEXUOSE, FLEXUOUS (Lat. *flexus*, bent), wavy.
FOLIACEOUS (Lat. *folium*, a leaf), flat and leaf-like.
FOLIOLOSE (Lat. *folium*, a leaf), consisting of minute lobes.
FORNICATE (Lat., arched), of the thalline apices, arched and hood-like.
FOVEOLATE (Lat. *fovea*, a small pit), pitted.
FRUTICOSE, FRUTICULOSE (Lat. *frutex*, a shrub), having the thallus attached by a single basal point, cylindrical, filamentous or strap-shaped.
FUCOID (Gr. *phukos*, seaweed, *eidos*, like), resembling seaweed.
FULIGINOUS (Lat. *fuligo*, soot), brown verging on black, soot-coloured.
FURCATE (Lat.), forked.
FURCELLATE (Lat. *furcula*, a little fork), minutely forked.
FURFURACEOUS (Lat. *furfur*, bran), scurfy.
FUSCOUS (Lat. *fuscus*, dark), of a dingy-brown colour.
FUSIFORM (Lat. *fusus*, a spindle, *forma*, shape), long and tapering towards each end—FUSOID.

GEMINATE (Lat. *gemini*, twins), in pairs.
GENICULATE (Lat. *genu*, the knee), bent like the knee.
GIBBER, GIBBOUS (Lat. *gibbus*, a hump), with hump-like swellings.
GLABROUS (Lat. *glaber*, without hair), with a hairless surface.

GLAUCOUS (Gr. *glaukos*, bluish-grey), sea-green or greyish-blue like the bloom on a plum or cabbage.
GLEBULOSE (Lat. *gleba*, a clod), with rounded elevations on the thallus.
GLOMERULES (Lat. *glomus*, a ball), a minute ball-like cluster — GLOMERULATE.
GLYPHOLECINE (Gr. *glyphe*, carving, *lekis*, a dish), with wavy or labyrinthine fruits as in the genus *Glypholecia*.
GONIDIMIUM, an algal-cell of small size such as occurs in the hymenium of some *Pyrenocarpei*.
GONIDIUM (Gr. *gonos*, offspring), a green algal cell (*Chlorophyceæ*), constituent of the lichen thallus.
GONIMIUM (Gr. *gonimos*, productive), a blue-green algal cell (*Cyanophyceæ*), constituent of the lichen thallus.
GRANULATE, GRANULAR, GRANULOSE (Lat. *granum*, a grain), consisting of minute particles.
GRISEOUS (Lat.), grey.
GUTTÆ (Lat. *gutta*, a drop), oil-drops in spore cells—GUTTULATE, *cf.* nucleolate.
GYALECTOID, applied to urceolate waxy apothecia, resembling those of the genus *Gyalecta*.
GYMNOTREMOID (Gr. *gumnos*, naked, *trema*, a hole, *eidos*, like), with a bare open spot or space.
GYROSE (Lat. from Gr. *guros*, round), curved backward and forward in turn.

HALONATE (Gr. *halos*, the disk of the sun, halo), surrounded by an outer circle.
HAPLOGONIDIA (Gr. *haploos*, single), gonidia occurring singly.
HAPLOGONIMIA (Gr. *haploos*, single), gonimia occurring singly.
HETEROMEROUS (Gr. *heteros*, other, *meros*, a part), fungal and algal constituents in definite strata in the thallus.
HISPID (Lat., bristly), beset with rough hairs or bristles.
HOMOEOMEROUS (Gr. *homoios*, like, *meros*, a part), fungal and algal constituents more or less mixed in the thallus.
HORMOGONIMIUM (Gr. *hormos*, a necklace), gonimia arranged in chains as in *Nostoc*, *cf.* moniliform.
HYMENIUM (Gr. *humen*, a membrane), the layer of tissue in the apothecium, consisting of asci and paraphyses, *cf.* thecium.
HYPHA (Gr. *hyphe*, a web), a fungal filament.
HYPOPHLŒODAL (Gr. *hypo*, under, *phloios*, bark), applied to thallus when growing within the bark.
HYPOTHALLUS (Gr. *hypo*, under, *thallus*, a sprout), the undergrowth of thalline hyphæ visible at the edge of the thallus.
HYPOTHECIUM (Gr. *hypo*, under, *theke*, a case), the layer below the thecium or hymenium.

IMBRICATE (Lat. *imbricatus*, covered with tiles), overlapping like the tiles on a roof.
IMPRESSED (Lat. *impressus*, pressed into), marked with slight depressions.
INCISED (Lat., cut into), cut sharply into the margin.
INCRASSATE (Lat. *incrassatus*, thickened), stout or thickened.
INDETERMINATE, without a definite outline, *cf.* effuse.
INFUNDIBULIFORM (Lat. *infundibulum*, a funnel), shaped like a funnel.
INFUSCATE (Lat. *infusco*, to make dusky), of a brownish colour.
INNATE (Lat. *innatus*, born in), embedded in the thallus.
INSCULPT (Lat. *insculptus*, engraved), cut into, forming holes or depressions.
INSPERSED (Lat. *inspersus*, spread about), interpenetrated with granules.
INTRICATE (Lat.), entangled.
ISABELLINE, "Isabella" colour, a dirty-tawny tint.
ISIDIIFEROUS (Lat. *fero*, to bear), thallus bearing isidia, *q.v.*

ISIDIUM (Gr. *isis*, a genus of corals, *eideos*, like), a coral-like outgrowth on the lichen thallus, rounded at the top, resembling the old genus *Isidium*.

JOINTED, septate.

LACERATE (Lat. *lacer*, mangled), torn or irregularly cleft.
LACINIA (Lat. *lacinia*, a fragment of cloth), a slender thalline lobe.
LACINIATE, thallus cut into narrow lobes.
LACUNA, LACUNOSE (Lat. *lacuna*, a hollow cavity), having depressions or holes.
LÆVIGATE (Lat.), smooth as if polished.
LAGENIFORM (Lat. *lagena*, a flask), shaped like a Florence flask.
LATERAL (Lat. *latus*, a side), fixed on or near the side of thallus or apothecium.
LECANORINE (*Lecanora*, a genus of lichens), applied to apothecia with a thalline margin as in the genus *Lecanora*.
LECIDEINE (*Lecidea*, a genus of lichens), applied to apothecia which are carbonaceous, usually dark-coloured and without a thalline margin, as in *Lecidea*.
LENTICULAR, LENTIFORM (Lat. *lens*, a lentil), lentil- or lens-like, doubly convex.
LEPRARIOID (Gr. *lepra*, leprosy), with a whitish mealy or scurfy surface like the old form genus *Lepraria*—LEPROSE.
LEPTOGIOID, similar to the genus *Leptogium*.
LEPTOGONIDIA (Gr. *leptes*, delicate, *gone*, offspring), algal cells of small size, *cf. gonidimia*.
LIGNICOLE, LIGNICOLOUS (Lat. *lignum*, wood, *colo*, to inhabit), living on wood or trees.
LIRELLA (Lat. *lira*, a ridge between two furrows), a long narrow apothecium with a ridge down the middle—LIRELLÆFORM.
LIVID (Lat.), of a leaden colour, pale and clouded.
LOBATE (Lat. *lobos*, the lower part of the ear), thallus divided into lobes—LOBULATE.
LOCULUS, LOCULAR (Lat., a little place), a compartment of a septate spore.
LURID (Lat. *luridus*, sallow, wan), dull, or dingy in colour.
LUTEOUS (Lat. *luteus*, gold-coloured), a full yellow-colour.

MACRO-, Greek prefix, signifying large.
MACROPHYLLINE (Gr. *makros*, long, *phullon*, a leaf), having large lobes.
MACULAR (Lat. *macula*, a spot), applied to a thallus occurring in spots.
MARGINAL, situate on the edge or margin.
MARGINATE, having a margin, term applied to apothecium.
MASTOID (Gr. *mastos*, a breast, *eidos*, like), nipple-like.
MAZÆDIUM, fructification of *Calicei*: spores free from the asci forming a powdery mass in almost closed heads.
MEDULLA (Lat. *pith*), the loose hyphal layer in the interior of the thallus.
MEMBRANACEOUS, thin, like a membrane.
MICRO-, Greek prefix, signifying small.
MICROPHYLLINE (Gr. *mikros*, small, *phullon*, a leaf), composed of minute lobes or scales.
MINIATE (Lat. *miniatus*), coloured like red lead or cinnabar.
MONILIFORM (Lat. *monile*, a necklace), in rows, like a string of beads.
MONO-, Greek prefix, signifying one.
MONŒCIOUS (Gr. *monos*, one, *oikos*, a house), with male and female organs on the same plant.
MONOPHYLLOUS (Gr. *monos*, one, *phullon*, a leaf), one-leaved.
MONOTYPIC (Gr. *monos*, one, *tupos*, a type), having only one exponent, as a genus with one species.
MUCUS, MUCOSE (Lat. *mucus*, nasal secretion), mucilaginous.
MULTI-, Latin prefix, signifying many.

MULTIFID (Lat.), cleft into many lobes or segments.
MURALI-DIVIDED, MURIFORM (Lat. *murus*, a wall), term applied to multicellular spores that are divided like the masonry of a wall.
MUSCICOLE (Lat. *muscus*, moss, *colo*, to inhabit), living on mosses.
MYCELIUM (Gr. *mukes*, a mushroom), an aggregate of fungal hyphæ.
MYRIOSPORED (Gr. *myrios*, many, *spora*, a seed), with many spores.

NODULE (Lat. *nodus*, a knot), a small knot or rounded body.
NOSTOCINE (*Nostoc*, a genus of *Cyanophyceæ*), similar to *Nostoc*.
NUCLEAR (Lat. a *kernel*), sometimes signifying closed perithecia.
NUCLEOLATE, applied to spores that have conspicuous oil-drops, *cf.* guttulate.

OB-, Latin prefix, signifying in an inverse direction, as obconical, obovate.
OBLONG, longer than broad, with nearly parallel sides.
OBSOLETE (Lat. *obsoletus*, worn out), wanting or rudimentary.
OCHROLEUCOUS (Gr. *ochra*, yellow earth, *leukos*, white), yellowish-white.
OLEOSO-LOCULAR (Lat. *oleum*, oil, *loculus*, a little compartment), applied to spores with cells like drops of oil.
ORBICULAR (Lat., circular), a flat body with a circular outline.
OSSEOUS (Lat.), bone-like.
OSTIOLE (Lat. *ostiolum*, a little door), the opening in the perithecium through which the spores escape.
OVAL (Lat. *ovum*, an egg), shaped like an egg—OVATE, OVIFORM, OVOID.

PALMATE (Lat. *palma*, the palm of the hand), lobed in a finger-like manner.
PANNIFORM (Lat. *pannus*, a cloth), having the appearance of felt or woollen cloth—PANNOSE.
PAPILLA (Lat., a nipple), a small superficial protuberance.
PAPULOSE (Lat. *papula*, a pimple), beset with pimples or pustules.
PARAPHYSIS (Gr. *para*, beside, *phusis*, growth), a sterile filament in the hymenium growing alongside the asci.
PARATHECIUM (Gr. *para*, from beside, *theke*, a case), the layer immediately surrounding the thecium, continuation of the hypothecium.
PARIETAL (Lat. *paries*, a wall), belonging to a wall.
PARMELEINE, resembling the genus *Parmelia*, a term applied to shield-like apothecia—PARMELIOID.
PATELLULATE (Lat. *patella*, a small dish), applied to sessile marginate apothecia, resembling a little dish.
PATENT (Lat. *patens*, open), spreading, as of branches.
PATULOUS (Lat.), spreading.
PAUCI-, Latin prefix signifying few.
PEDICELLATE (Lat. *pediculus*, a small foot), borne on a stalk.
PELTATE (Lat. *pelta*, a small shield), orbicular and horizontal, in the form of a shield or target—PELTIFORM.
PENDULOUS (Lat.), hanging.
PERI-, Greek prefix signifying about, or outer covering, as perigonidium.
PERIDIUM (Gr. *peridion*, a little pouch), the covering of the upper part of a closed pyrenocarp, sometimes used for the whole fructification.
PERIPHERAL (Gr. *periphereia*, the circumference of a circle), surrounding.
PERIPHYSES (Gr. *peri*, about, *phusis*, growth), filaments rising near the mouth of the perithecium.
PERITHECIUM (Gr. *peri*, about, *theke*, a case), a roundish fructification entirely enclosed or with a minute opening at the apex.
PERTUSARIOID, like the genus *Pertusaria*, with the apothecia occurring in verrucæ, *q.v.*
PERVIOUS (Lat. *pervius*, passable), referring to scyphi that are open or perforate at the base.
PINNATE (Lat. *pinna*, a feather), lobes arranged on each side of a common axis.

PINNATIFID (Lat. *findo, fidi*, to cut), pinnately cut.
PISTILLAR (Lat. *pistillum*, a pestle), club-shaped.
PISTILLARI-BACILLAR, term applied to spermatia which are oblong and slightly thicker at the ends.
PLACODIOID, like the genus *Placodium*, with the thallus orbicular, adpressed, lobed at the circumference.
PLATYGONIDIA (Gr. *platus*, broad, *gonos*, offspring), gonidia in broadly spreading groups (*Cephaleuros*).
PLATYPHYLLOUS (Gr. *platus*, broad, *phullon*, a leaf), broadly lobed.
PLICATE (Lat. *plico*, to fold), folded in plaits—PLICIFORM.
PLURI-, Latin prefix signifying many.
PLURILOCULAR, many-celled.
PODETIUM (Gr. *pous, podos*, a foot), a stalk-like thalline elevation supporting an apothecium.
POLARI-BILOCULAR, of two-celled spores with a thick central wall traversed by a connecting tube, the lumen of the cells at the extreme ends.
POLY-, Greek prefix signifying many.
POLYMORPHOUS (Gr. *polus*, many, *morphe*, a change), with several or various forms.
POLYPHYLLOUS (Gr. *polus*, many, *phullon*, a leaf), many-leaved.
PROLIFEROUS (Lat. *proles*, offspring, *fero*, to bear), bearing offshoots.
PROPER MARGIN, the rim or margin encircling the apothecium, as distinct from the thalline margin.
PROTOCOCCOID, like the genus *Protococcus*.
PRUINA (Lat., hoar-frost), powdery secretion or bloom on the surface of plants—PRUINOSE.
PSEUDO- (Gr. *pseudos*, false), used as a prefix signifying false or spurious.
PULVERACEO-DELITESCENT (Lat. *pulvis*, powder, *delitesco*, to lie hid), covered with a layer of powdery granules.
PULVERULENT (Lat. *pulvis*, powder), powdery.
PULVINATE (Lat. *pulvinatus*, cushion-shaped), thallus growing in cushion-like masses.
PULVINULUS, a small cushion-like outgrowth.
PYCNIDE (Gr. *puknos*, dense), a closed fructification containing stylospores.
PYRENIUM (Gr. *puren*, a kernel), the outer wall of a perithecium or sometimes of a fructification.
PYRENOCARP (Gr. *carpos*, fruit), a closed fructification (perithecium) opening above by a pore or slit.
PYRENODEINE (PYRENODINE), (Gr. *eidos*, like), a term applied to perithecia—PYRENOID.
PYRENOPSIDIAN, similar to the genus *Pyrenopsis*.
PYRIFORM (Lat. *pyrus*, a pear), pear-shaped.

RADIATE (Lat. *radius*, a ray or the spoke of a wheel), spreading outwards from a centre.
RADIUS, RADII, the outermost lobes or squamules.
RAMOSE (Lat. *ramus*, a branch), branching.
RAMULI, branchlets or secondary branches.
RAPHIDES (Gr. *raphis*, a needle), needle-shaped crystals.
RECEPTACLE (Lat. *receptaculum*, a reservoir), term used for the base or surrounding tissue of the apothecium.
RENIFORM (Lat. *renis*, a kidney), kidney-shaped.
REPAND (Lat., bent backwards), with an uneven margin, less so than sinuous.
RETICULATE (Lat. *rete*, a net), resembling a net-work.
RETUSE (Lat. *retusus*, blunted), with a shallow notch in a rounded apex.
REVOLUTE (Lat. *re*, back, *volvo*, to roll), rolled back from the margin or apex.
RHAGADIOSE (Gr. *rhagas*, a chink), cracked or fissured.
RHIZINA, pl. RHIZINÆ (Gr. *rhiza*, a root), root-like strands or hairs.

RIMA (Lat., a cleft), a chink or cleft—RIMOSE.
RIVULOSE (Lat. *rivus*, a stream), having sinuate channels or lines.
ROSULATE (Lat. *rosa*, a rose), collected into a rosette.
ROTUNDATE (Lat. *rotundus*, round), rounded.
RUBRICOSE (Lat. *ruber*, red), reddish.
RUGOSE, RUGULOSE (Lat. *ruga*, a wrinkle or fold), wrinkled.

SACCATE (Lat. *saccus*, a bag), swollen, sack-shaped.
SANGUINEOUS (Lat.), blood-red.
SAXICOLE, SAXICOLOUS (Lat. *saxum*, a rock, *colo*, to inhabit), growing on rocks or stones.
SCABRID, SCABROUS (Lat.), rough with minute elevations.
SCROBICULATE (Lat. *scrobiculus*, a little trench), marked with small pits.
SCUTELLATE (Lat. *scutella*, a salver), shaped like a platter—SCUTELLIFORM.
SCYPHUS (Gr. *skuphos*, a cup), a cup-like dilatation of the podetium in lichens on the edges of which are borne the apothecia—SCYPHIFEROUS (SCYPHIPHOROUS), bearing scyphi.
SECUND (Lat. *secundus*, second or following), with parts directed to one side only.
SEPTATE (Lat. *septum*, a fence or enclosure), divided by a partition or cell-wall.
SESSILE (Lat. *sessilis*, sitting), without any stipe or stalk.
SETACEOUS (Lat. *seta*, a bristle), slender, bristle-like—SETULIFORM.
SINUATE (Lat. *sinus*, a curve), with a deep wavy margin.
SINUS (Lat., a curve or fold), a recess or re-entering angle.
SIROSIPHOID, resembling the genus *Sirosiphon* (*Stigonema*), where the cells occur usually in two or more rows.
SMARAGDINE (Gr. *smaragdos*, an emerald), emerald or dark-bluish-green.
SORDID (Lat. *sordidus*, fouled), dirty in tint.
SPADICEOUS (Gr. *spadix*, a palm-branch), bright date-brown in colour.
SPEIROGONIMIA (Gr. *speiro*, to sow, to scatter), gonimia single, scattered.
SPERMATIUM (Gr. *sperma*, a seed), a spore-like body formed in the spermogone, regarded as a non-motile male cell or as a spore.
SPERMOGONE (Gr. *sperma*, a seed, *gonos*, offspring), closed receptacle containing spermatia.
SPHINCTRIFORM, like the genus *Sphinctrina* (apothecia almost sessile).
SPINOSE, SPINULOSE (Lat. *spina*, a thorn), beset with spines.
SPONGIOSE (Lat. *spongia*, a sponge), soft and spongy.
SPORE (Gr. *spora*, a seed), a reproductive body which becomes free and germinates to form a new plant.
SPURIOUS (Lat. *spurius*, illegitimate), counterfeit, apparent but not real.
SQUAMULE (Lat. *squama*, a scale), a small thalline lobe.
STELLATE, STELLATO- (Lat., starry), star-shaped or radiating like the rays of a star.
STERIGMA, pl. STERIGMATA (Gr. *sterigma*, a prop), the stalk (spermatiophore) from which the spermatia are abjointed.
STIPATE (Lat.), crowded.
STIPES (Lat., a trunk of a tree), stalk—STIPITATE.
STRAMINEOUS (Lat. *stramen*, straw), straw-coloured.
STRATUM (Lat.), a layer of tissue.
STRIATE (Lat. *stria*, a furrow), marked with parallel lines or ridges—STRIATULATE.
STRUMOSELY (Lat. *struma*, a scrofulous tumour), with cushion-like swellings.
STYLOSPORE (Gr. *stulos*, a column, *spora*, a seed), a spore borne on a filament.
SUB-, Latin prefix, signifying under, below or partly.
SUBICULUM (Lat., an underlayer), a felted undergrowth of hyphæ.
SUBULATE (Lat. *subula*, a small weapon), shaped like an awl.
SULCATE (Lat.), furrowed or grooved.
SUTURE (Lat. *sutura*, a seam), a line of opening.

SYMBIONT (Gr. *sun*, with, *bios*, life), one of two dissimilar organisms living together.
SYMBIOSIS, SYMBIOTIC, a living together of dissimilar organisms, with mutual benefit, also styled commensalism, consortism, individualism, and mutualism.
SYMPHICARPOUS, SYMPHYCARPOUS (Gr. *sumphuo*, to grow together, *carpos*, fruit), with confluent apothecia.
SYNGONIMIA (Gr. *sun*, with), gonimia united in clumps.

TARTAREOUS, resembling tartar, having a more or less rough crumbling surface, or thickish, and almost smooth.
TEREBRATE (Lat. *terebra*, a borer), with scattered perforations.
TERMINAL (Lat. *terminare*, to limit), on the end of a stalk or branch.
TERRICOLOUS (Lat. *terra*, the earth, *colo*, to inhabit), living on soil.
TESSELLATE (Lat. *tessella*, a small square piece of stone), resembling a tessellated pavement.
TESTACEOUS (Lat. *testa*, a brick or tile), brick-red.
THALAMIUM (Gr. *thalamos*, a bed-chamber), layer of tissue in the apothecium, consisting of paraphyses and periphyses.
THALLINE MARGIN, an apothecial margin formed of and usually coloured like the thallus, *cf.* amphithecium.
THALLOID EXCIPLE, thalloid margin of the apothecium.
THALLUS (Gr. *thallos*, a sprout), vegetative part of the lichen-plant.
THECA (Gr. *theke*, a case), an enlarged cell containing spores, *cf.* ascus.
THECIFEROUS (Gr. *theke*, a case, Lat. *fero*, to carry), bearing the asci.
THECIUM (Gr. *theke*, a case), the layer of tissue in the apothecium consisting of asci and paraphyses, *cf.* hymenium.
THELOTREMOID, having tubercular apothecia like those of the genus *Thelotrema*.
THYRSOID (Lat. *thyrsus*, the bacchic staff, Gr. *eidos*, like), with crowded, dichotomous branching.
TOMENTOSE (Lat. *tomentum*, a stuffing for cushions), densely covered with down-like hairs.
TORULOSE (Lat. *torus*, muscle), cylindric, with swollen portions at successive intervals.
TRABECULOSE (Lat. *trabecula*, a little beam), applied to reticulating fibrils.
TRICHOTOMOUSLY (Gr. *triche*, in a three-fold manner, *tome*, a cutting), branching in a three-fold manner.
TRIVIAL (Lat. *trivialis*, common), the specific name.
TRUNCATE (Lat.), ending abruptly, as if cut off.
TUBERCLE (Lat. *tuber*, a tumor), a small excrescence or wart—TUBERCULATE, TUBERCULOSE.
TUBULIFORM (Lat. *tubulus*, a small pipe), applied to a thallus of round pipe-like filaments.
TUMID (Lat.), inflated, swollen.
TUNICATED (Lat. *tunica*, a garment), having a coat or covering.
TURBINATE (Lat. *turbo*, a whipping-top), shaped like a top.
TURGID (Lat. *turgidus*, inflated), swollen.

UMBER, UMBRINE (Lat.), the colour of umber, a dull-brown.
UMBILICATE (Lat. *umbilicus*, the navel), navel-like, depressed in the centre.
UMBILICATELY, applied to a thallus centrically affixed to the matrix.
UMBO, UMBONATE (Lat. *umbo*, any convex elevation), bearing an umbo in the centre.
UNDULATE (Lat. *unda*, a wave), with a wavy margin.
UNISERIATE (Lat. *unus*, one, *series*, a succession), in one row.
URCEOLATE (Lat. *urceus*, a pitcher), pitcher-like, hollow and contracted at the mouth.

VARIOLARIOID (Lat. *variola*, the pustule of small-pox), with powdery or granular tubercles like the supposed fructification of the old genus *Variolaria*—VARIOLOSE.
VENTRICOSE (Lat. *venter*, the belly), swollen or inflated.
VERMICULAR (Lat. *vermiculus*, a little worm), worm-shaped.
VERRUCA (Lat., a wart), the granular wart-like part of the thallus.
VERRUCARIOID, fructification similar to that of the genus *Verrucaria*.
VERSICOLOROUS (Lat. *verso*, to turn often, *color*, colour), changing colour.
VERTICIL (Lat. *vertex*, a whirl), a whorl, circular arrangement of parts round an axil—VERTICILLATE.
VESICULOSE (Lat. *vesicula*, a bladder), as if composed of small bladders.
VILLOSE (Lat. *villus*, a shaggy hair), bearing long hairs.
VITELLINE (Lat. *vitellus*, the yolk of an egg), egg-yellow.

ZEORINE, like the old genus *Zeora*, in which the apothecium had a double margin.

ERRATA

P. 22.—Under **Lecidea coarctata** var. *glebulosa* Cromb. Lich. Brit. *read* p. 66, *instead of* p. 76.

P. 46.—Under **Lecidea livescens** *read* spores 0,007 mm. long, *instead of* 0,007–3 mm. long.

P. 47.—Under **Lecidea micrococca** *transfer* references Nyl. and Cromb.

P. 118.—Under **Biatorina Griffithii** *read* spores 0,0035–45 mm. thick, *instead of* 0,035–45 mm.

P. 167.—Under **Buellia alocizoides** *add synonym Verrucaria Leightonii* Deakin in Ann. Mag. Nat. Hist. ser. 2, xiii. p. 34, t. 1, fig. 3 (1854).

P. 295.—*For* **Verrucaria Harrimani** *read* **Verrucaria Harrimanni.**

P. 313.—Under **ACROCORDIA** *read* Pl. 48, *instead of* Pl. 47.

P. 326.—Under **Arthopyrenia halodytes** *after* note *add* The specimen, cited by Leighton under *Verrucaria fluctigena* as from Crombie, was not found in Herb. Crombie.

Pl. 20.—*For* **Arthonia astroidea** Ach. *read* **Arthonia radiata** Ach.

Pl. 30.—*For* **Graphina sophistica** Nyl. *read* **Graphina anguina** Muell.-Arg.

Biatorina jejuna p. 114 was included by Crombie (Part I. p. 393) as *Lecanora jejuna* Nyl. a synonym of *Lecanora Ralfsii*.

Similarly—

Buellia polospora p. 168 was included (Part I. p. 383) as *Lecanora biloculata* Nyl. Both species are of doubtful position, but fall more naturally into *Lecideaceæ*. Their classification under *Lecanora* was overlooked.

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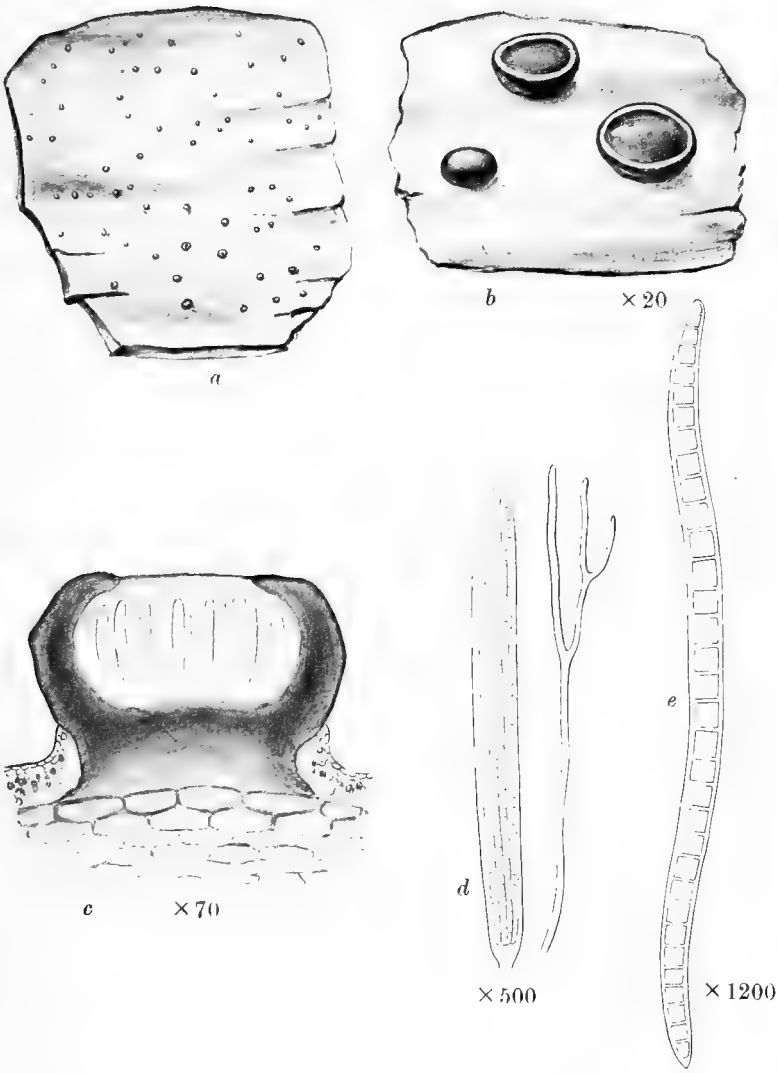

CONOTREMA URCEOLATUM Tuckerm.

a. Plant on bark. *b*. Portion of thallus and apothecia. *c*. Vertical section of apothecium. *d*. Ascus and paraphysis. *e*. Single spore.

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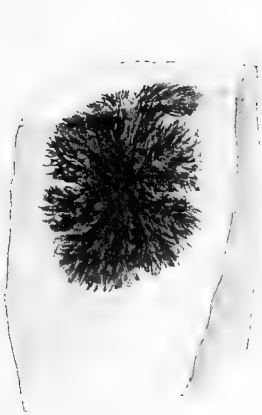
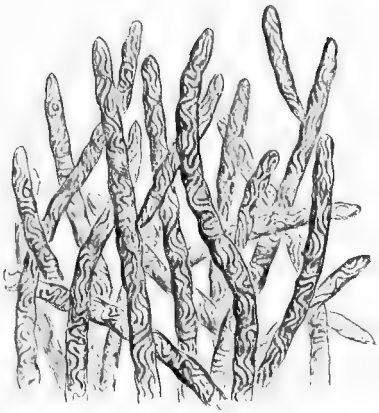
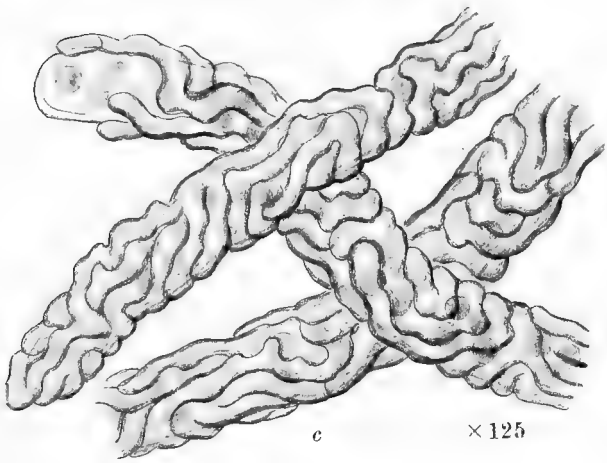


a



b ×25



c ×125

CŒNOGONIUM EBENEUM A. L. Sm.

a. Plant on stone. *b*. Portion of thallus. *c*. Filaments of thallus.

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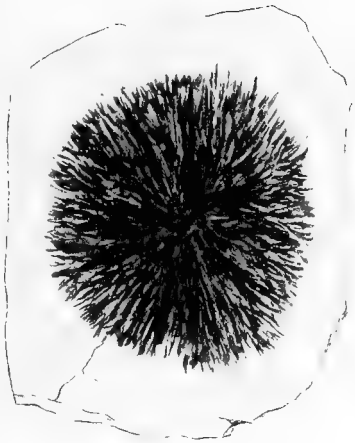

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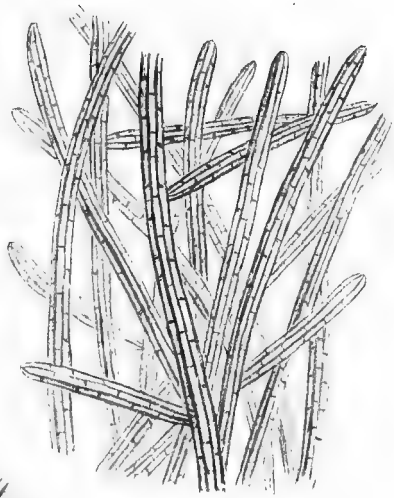
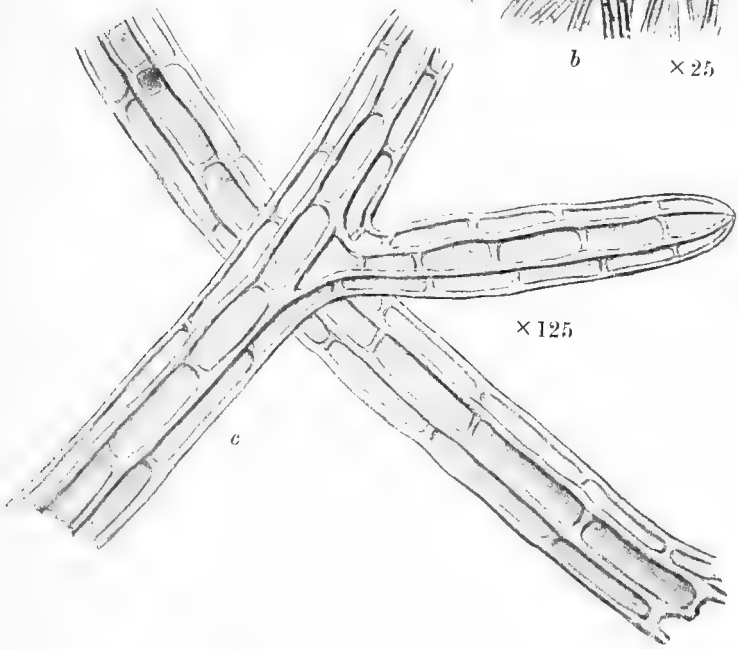


b ×25



×125

c

RACODIUM RUPESTRE Pers.

a. Plant on rock. *b*. Portion of thallus. *c*. Filaments of thallus.

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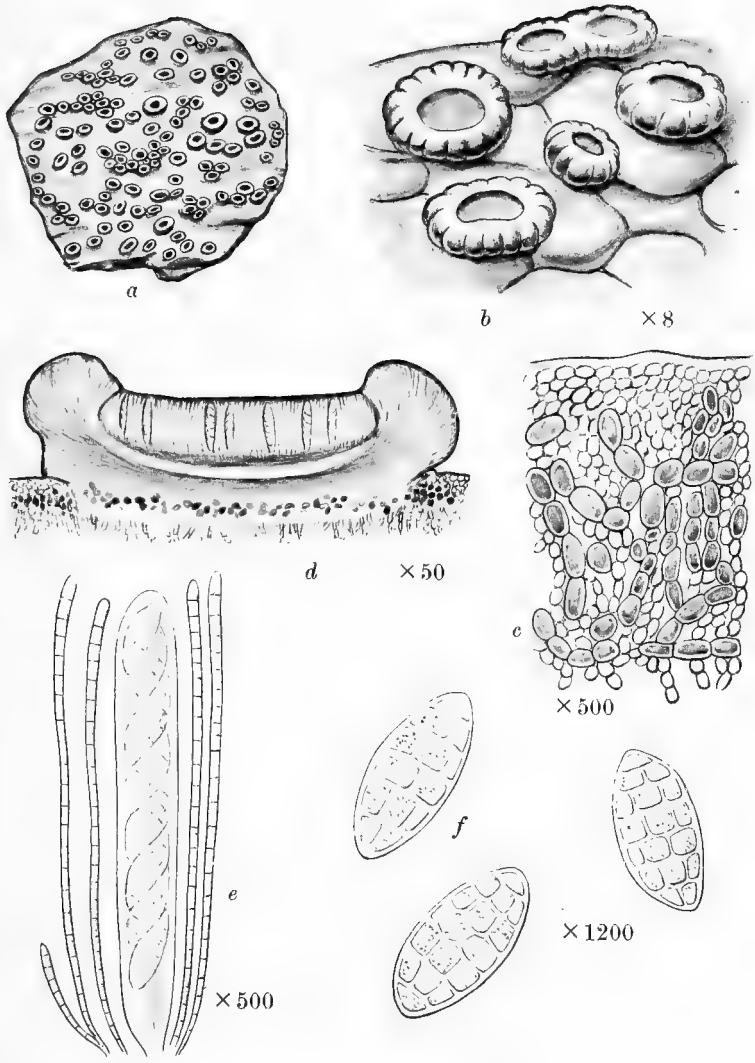

GYALECTA CUPULARIS Schær.

a. Plant on rock. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecium. *e*. Ascus and paraphyses. *f*. Spores.

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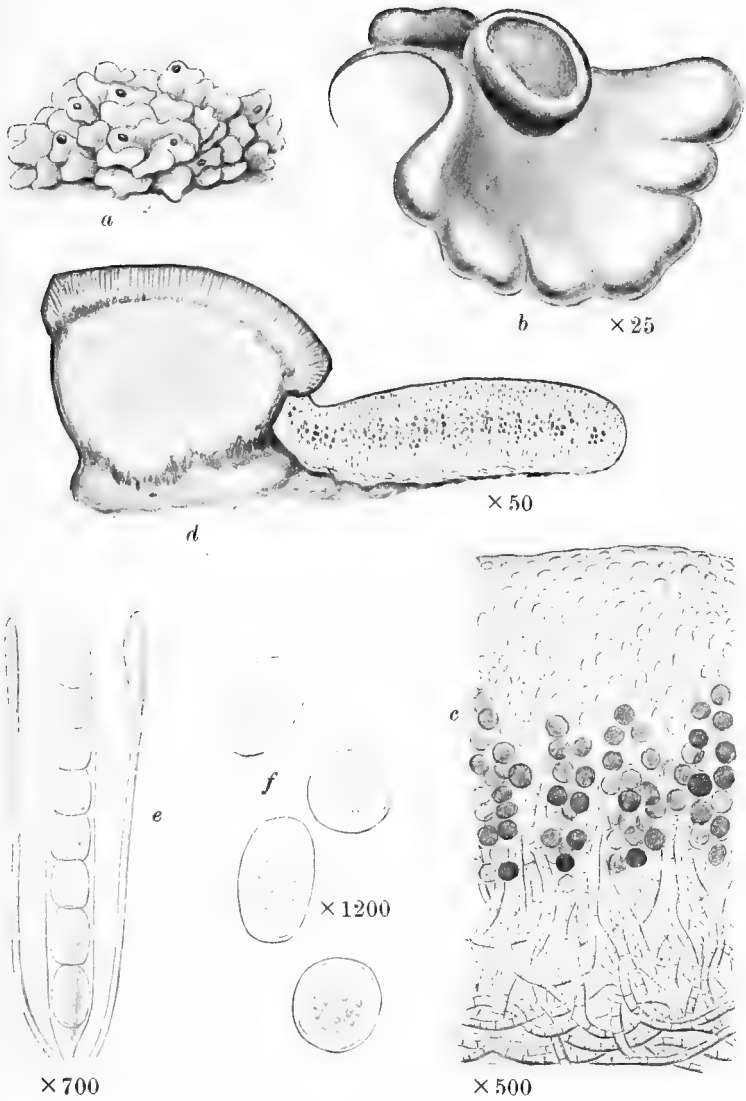

LECIDEA (PSORA) LURIDA Ach.

a. Plant. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecium. *e*. Ascus and paraphyses. *f*. Spores.

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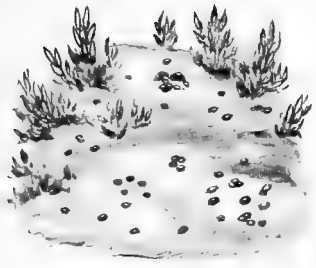
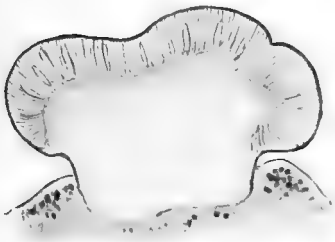
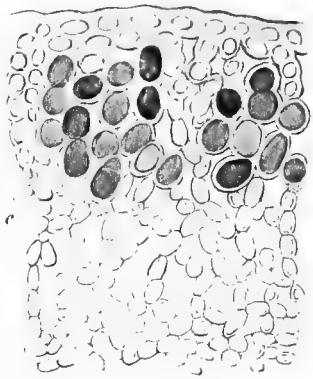


a

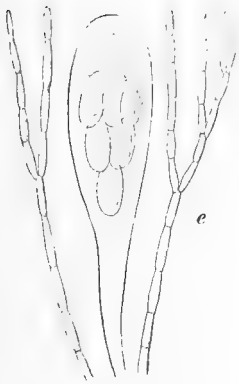
b × 25



d × 60



c × 500



e × 500

f × 1000

LECIDEA (BIATORA) VERNALIS Ach

a. Plant on moss. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecium. *e*. Ascus and paraphyses. *f*. Spores.

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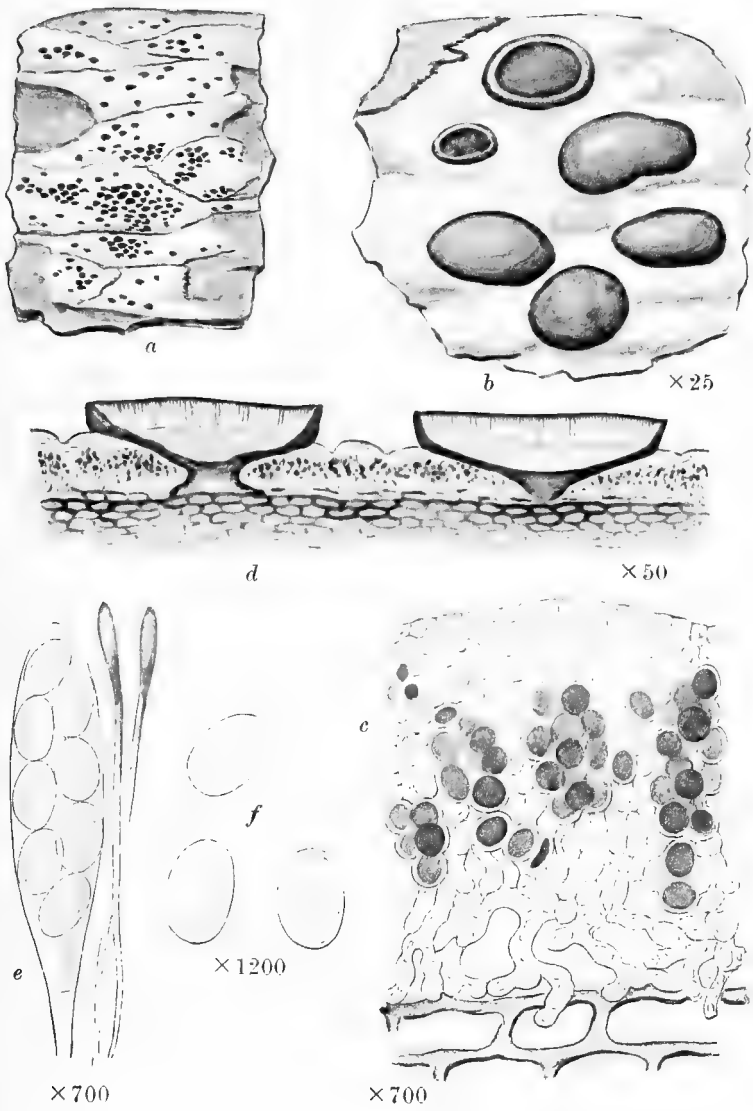

LECIDEA (EULECIDEA) PARASEMA Ach.

a. Plant on bark. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecia. *e*. Ascus and paraphyses. *f*. Spores.

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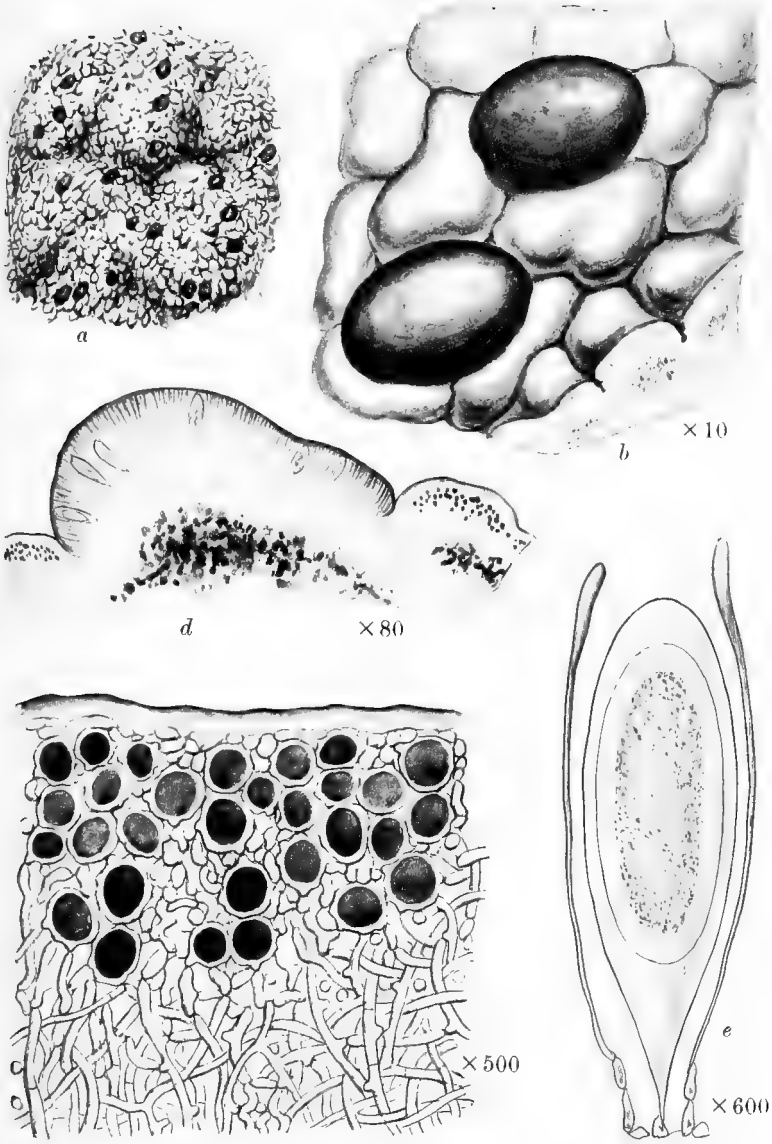

LECIDEA (MYCOBLASTUS) SANGUINARIA Ach.

a. Plant. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecium. *e*. Ascus with spore and paraphyses.

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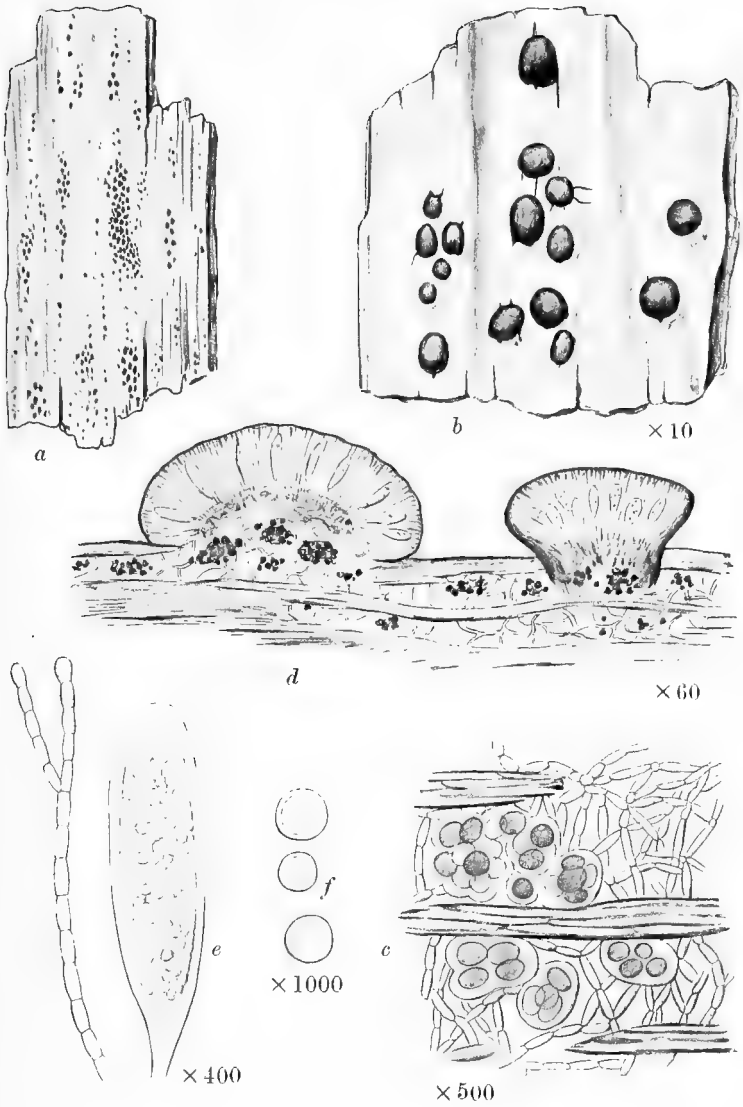

BIATORELLA MORIFORMIS Th. Fries

a. Plant on wood. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecia. *e*. Ascus and paraphysis. *f*. Spores.

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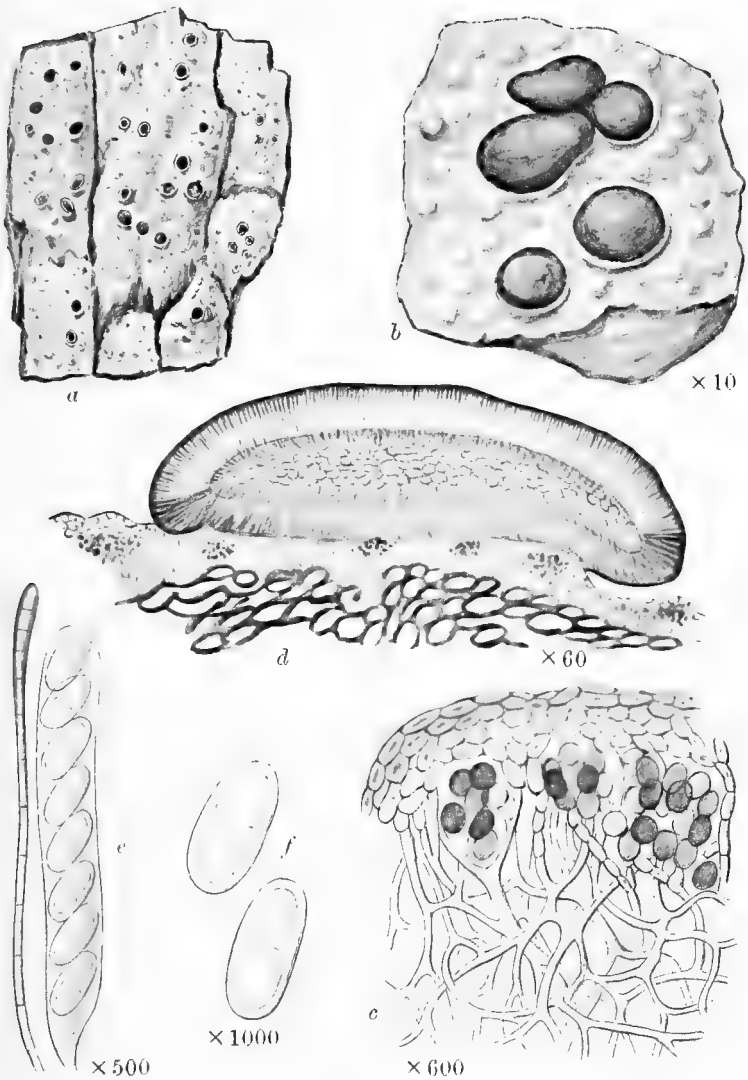

BIATORINA PULVEREA Mudd

a. Plant on bark. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecium. *e*. Ascus and paraphysis. *f*. Spores.

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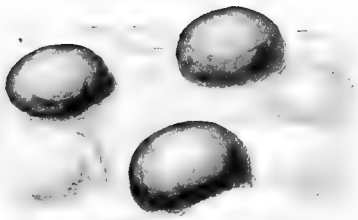
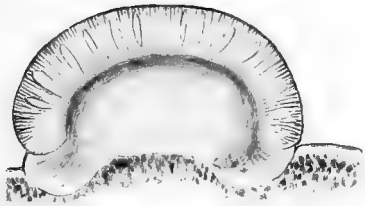
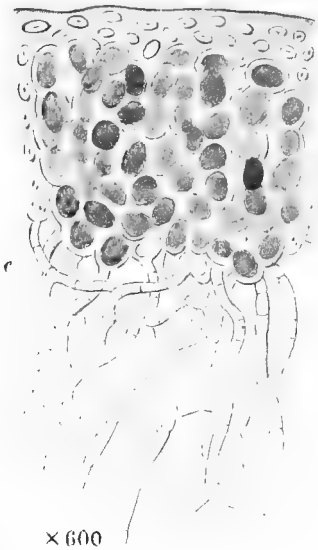
a



b ×25



d ×60



c

e

f

×1000

×600

×600

BILIMBIA VIRIDESCENS A. L. Sm.

a. Plant on moss. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecium. *e*. Ascus and paraphyses. *f*. Spores.

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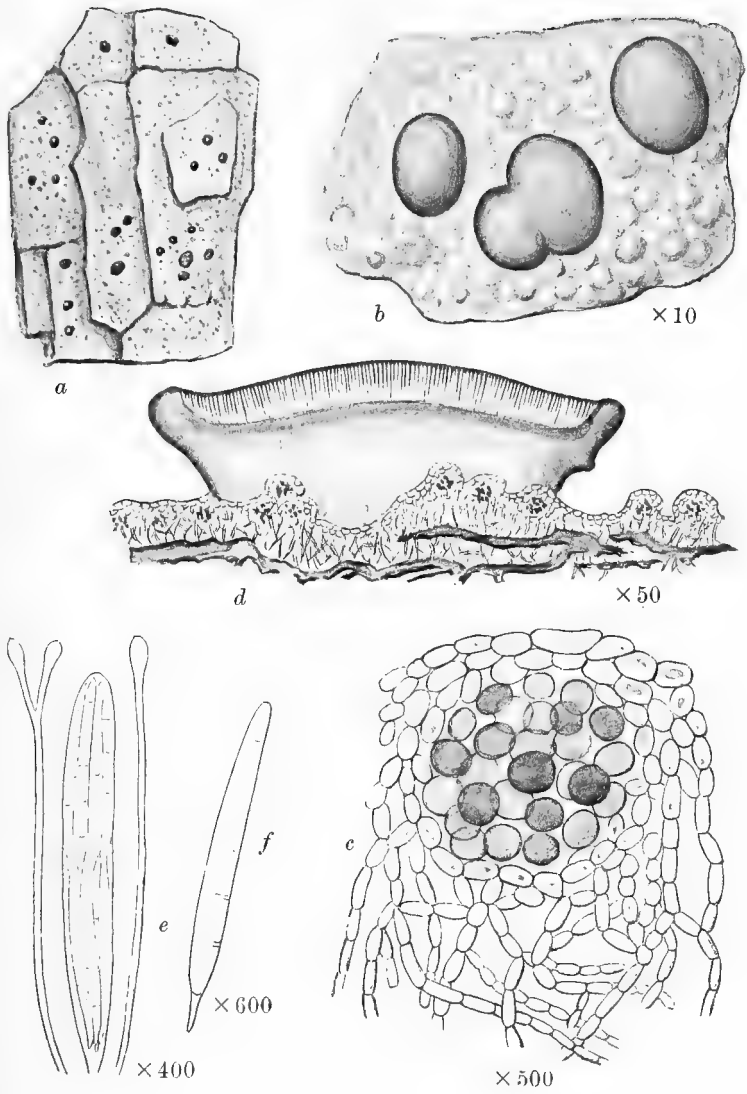

BACIDIA RUBELLA Massal.

a. Plant on bark. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecium. *e*. Ascus and paraphyses. *f*. Spore.

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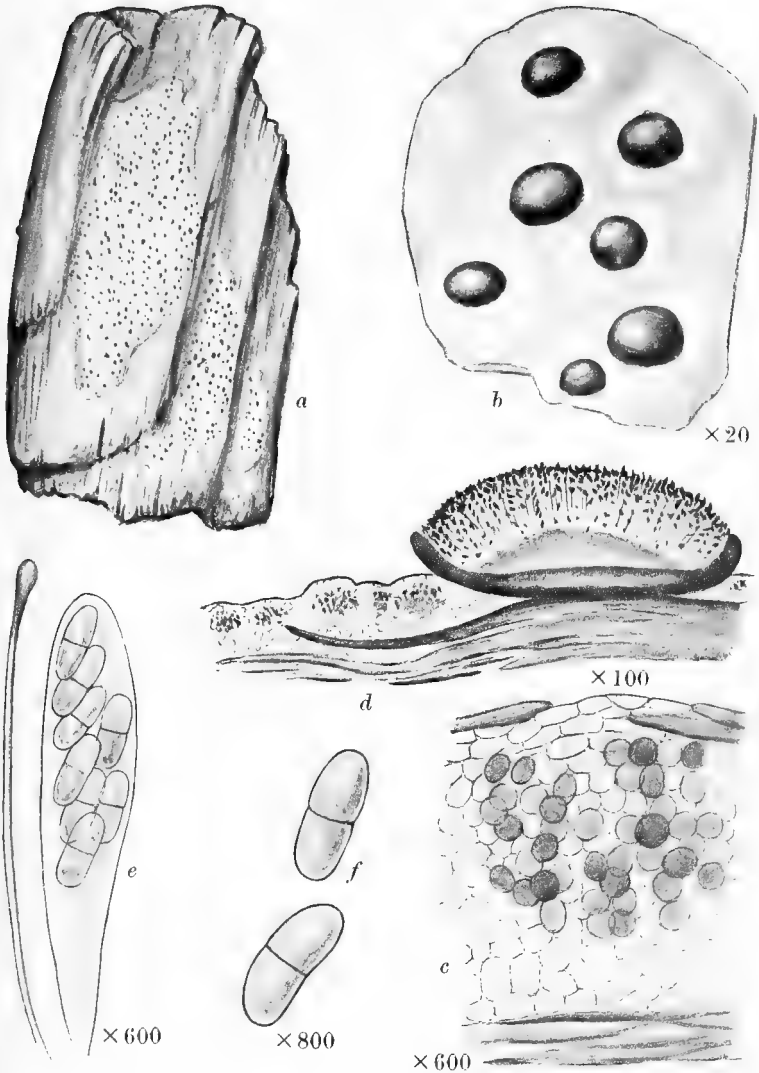

BUELLIA MYRIOCARPA Mudd

a. Plant on wood. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecium. *e*. Ascus and paraphysis. *f*. Spores.

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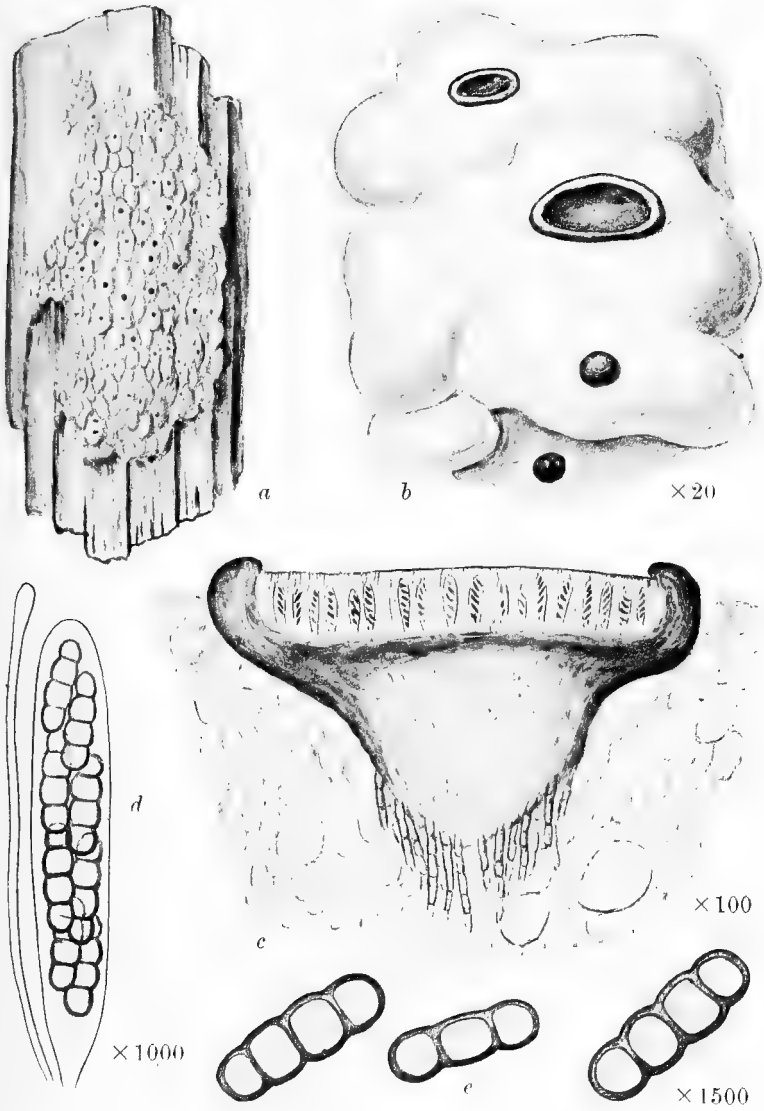

LECIOGRAPHA PARASITICA Massal.

a. Plant on lichen. *b*. Portion of host and apothecia. *c*. Vertical section of apothecium. *d*. Ascus and paraphysis. *e*. Spores.

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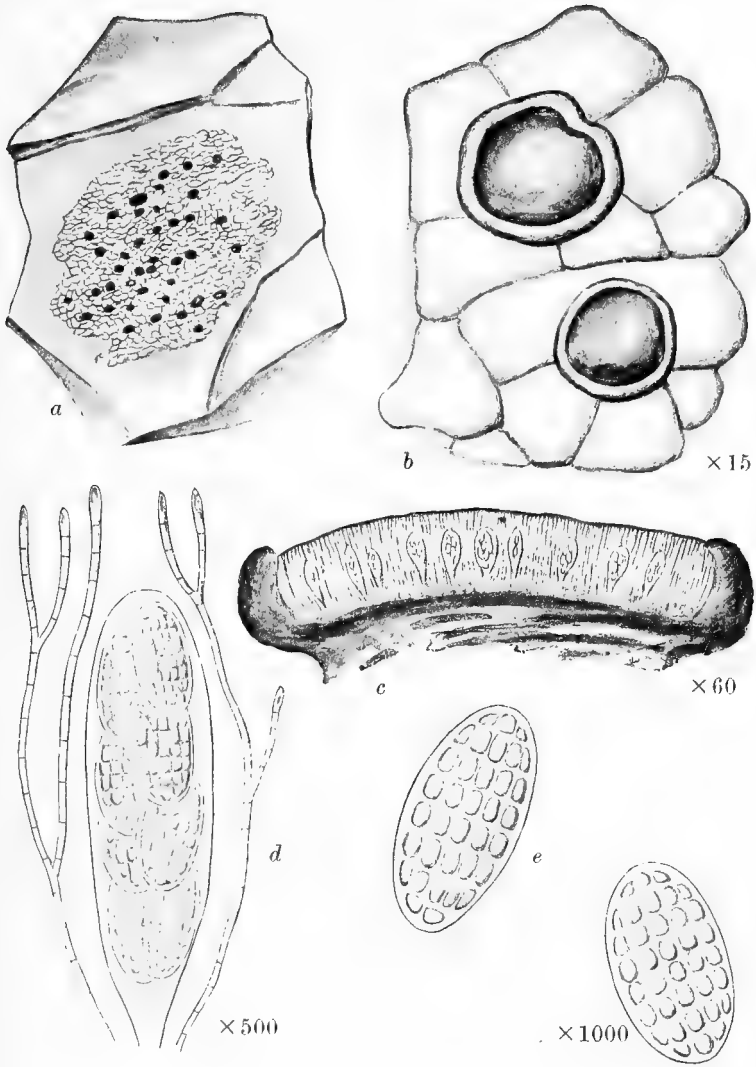

RHIZOCARPON OBSCURATUM Massal.

a. Plant on rock. *b*. Portion of thallus and apothecia. *c*. Vertical section of apothecium. *d*. Ascus and paraphyses. *e*. Spores.

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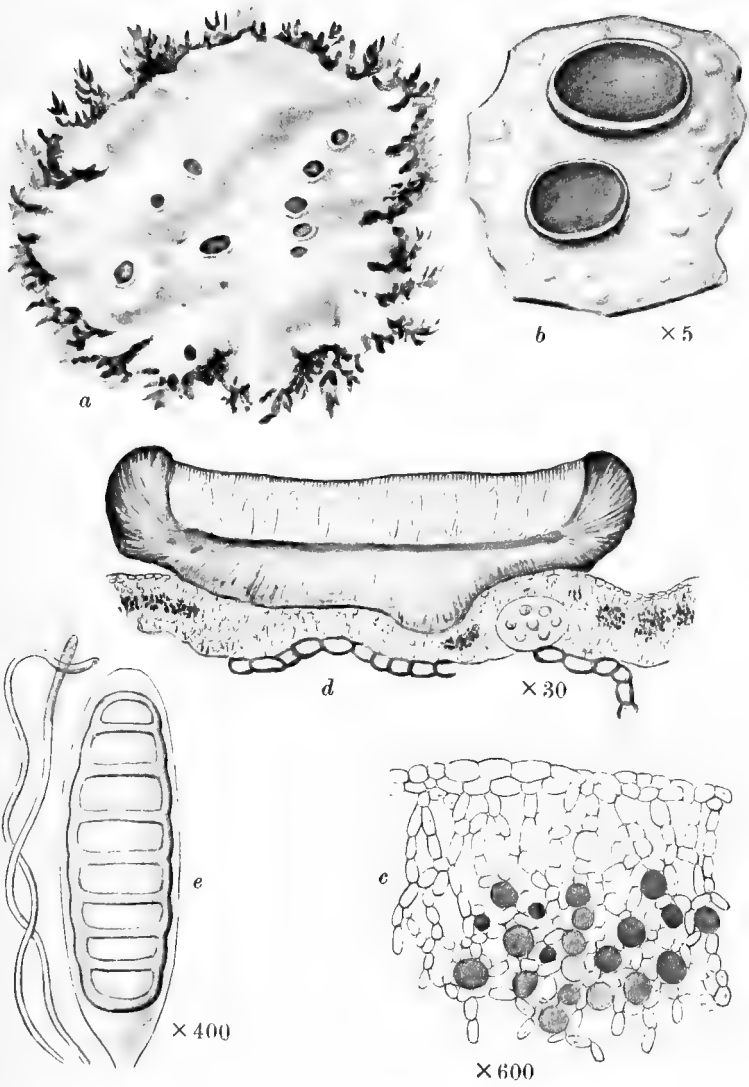

BOMBYLIOSPORA PACHYCARPA Massal.

a a c *a*. Plant on moss. *b*. Portion of thallus and apothecia. *c*. Vertical section
o o c of thallus. *d*. Vertical section of apothecium. *e*. Ascus with spore and
paraphyses.

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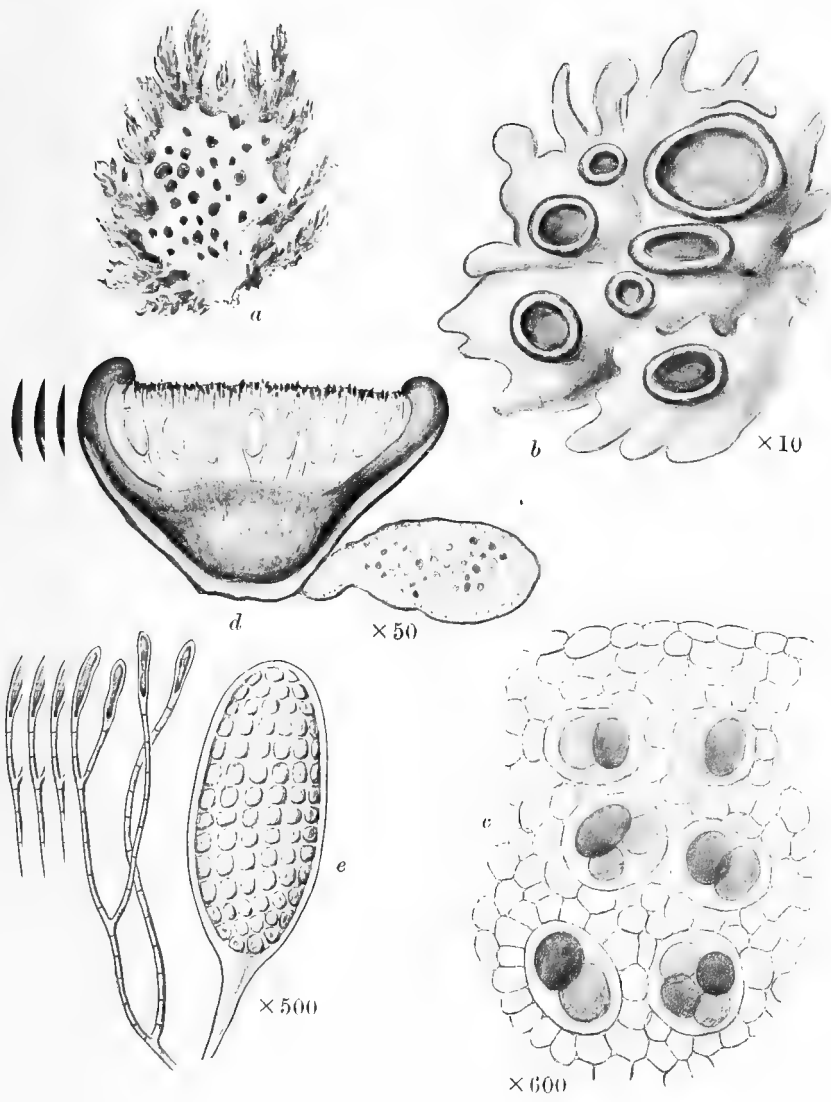
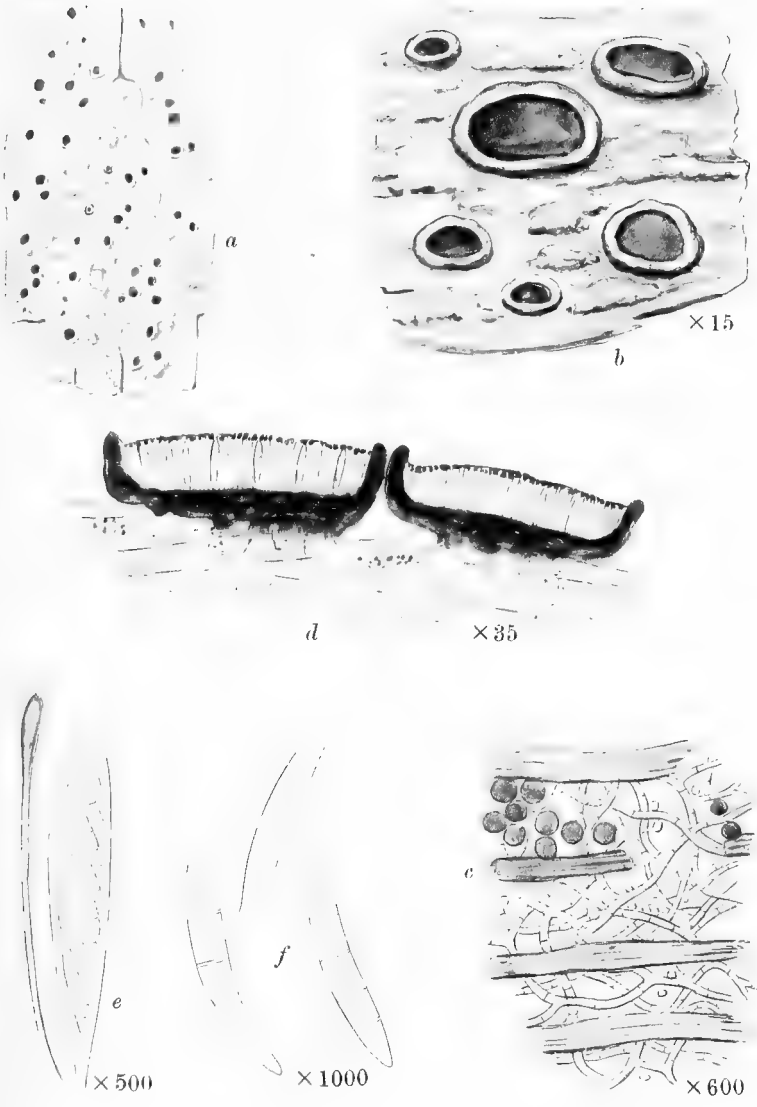


LOPADIUM PEZIZOIDEUM Koerb.

a, a, a, a. Plant on moss. *b.* Portion of thallus and apothecia. *c.* Vertical section of thallus. *d.* Vertical section of apothecium. *e.* Ascus with spore and paraphysis.

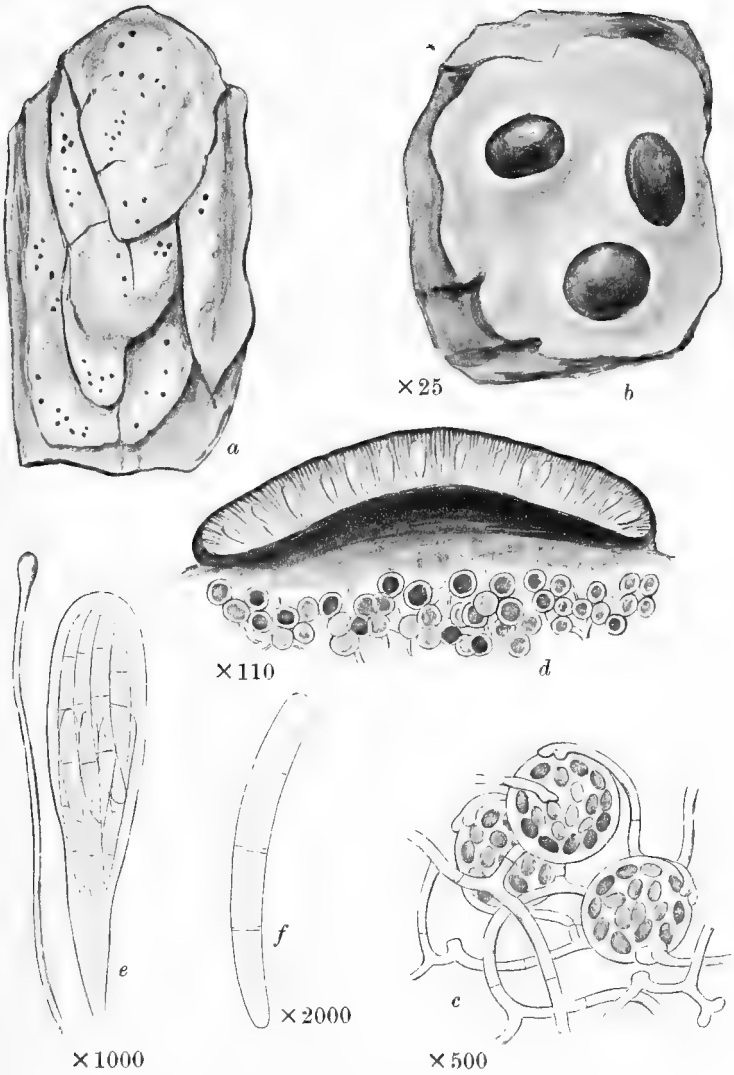
Cornell University Library



LECANACTIS PREMNEA Wedd.

a. Plant on bark. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecia. *e*. Ascus and paraphysis. *f*. Spores.

Cornell University Library

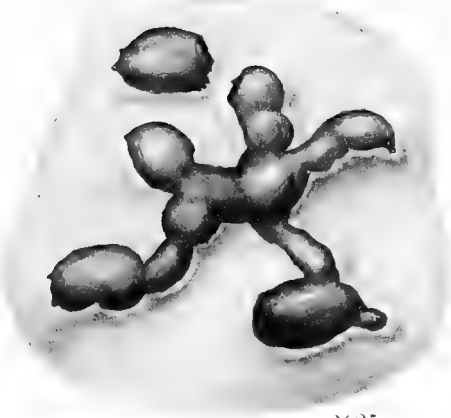


PLATYGRAPHA PERICLEA Nyl.

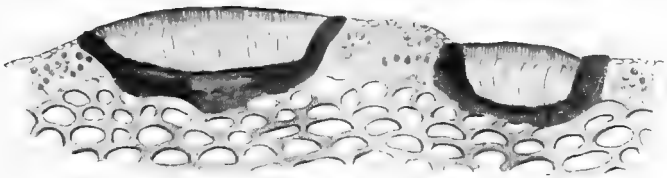
a. Plant on bark. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecium. *e*. Ascus and paraphysis. *f*. Spore.

Cornell University Library

a



b ×25



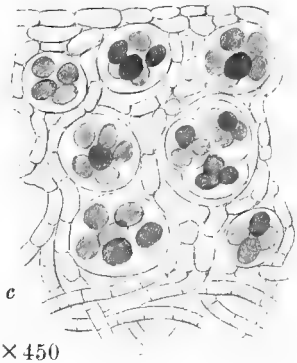
d ×80

e

f

×1000

×700



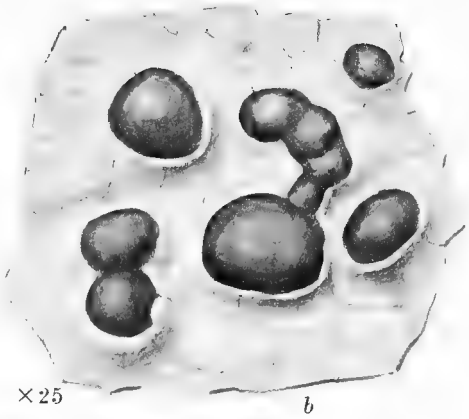
c

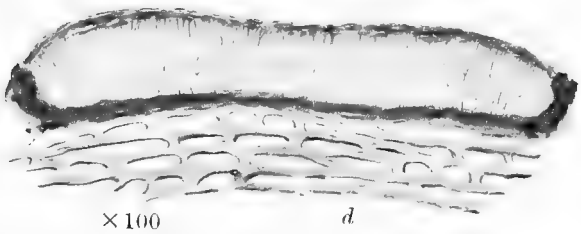
×450

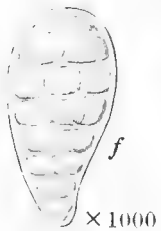
ARTHONIA ASTROIDEA Ach.

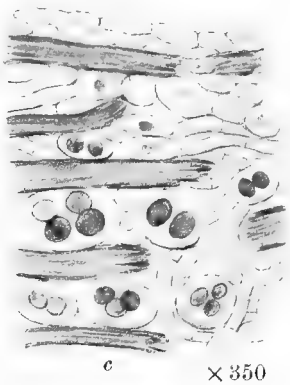
a. Plant on bark. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecia. *e*. Ascus and paraphyses. *f*. Spores.

Cornell University Library





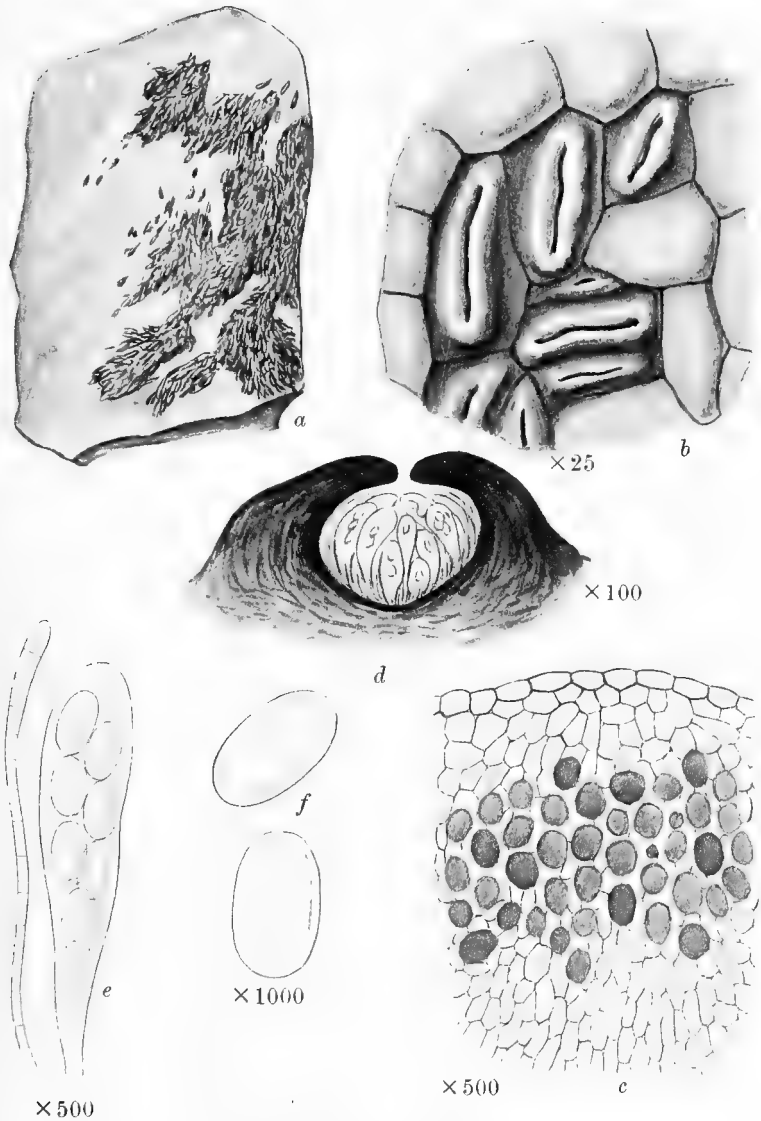




ARTHOTHELIUM SPECTABILE Massal.

a. Plant on bark. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecium. *e*. Ascus. *f*. Spore.

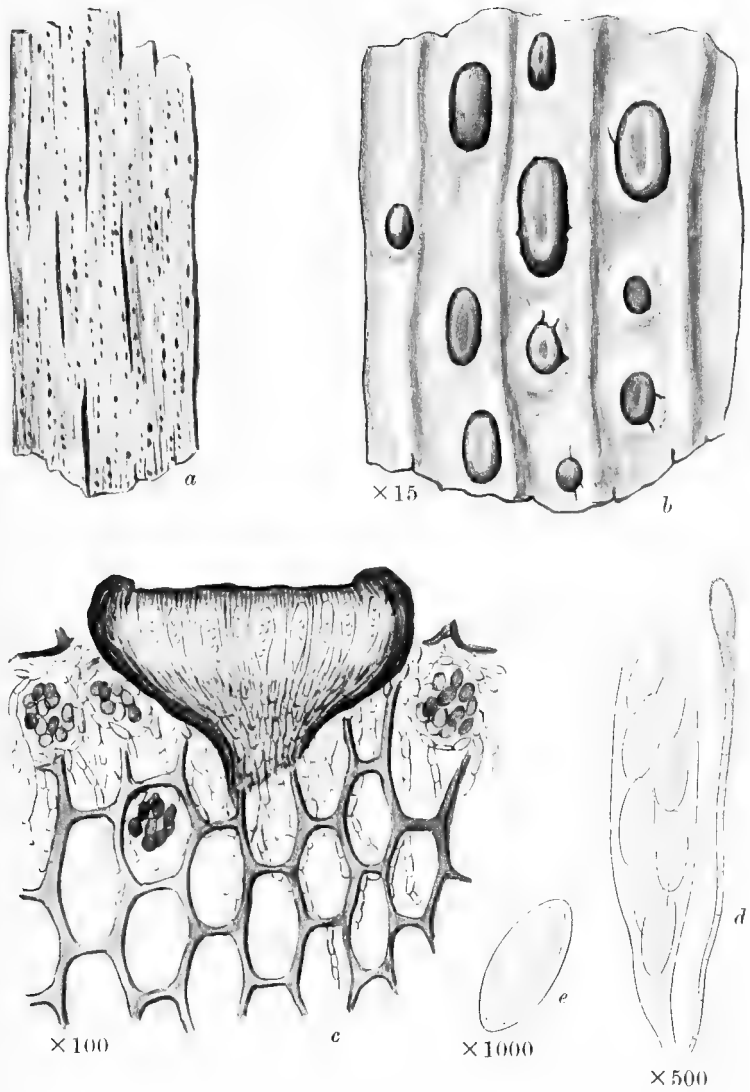
Cornell University Libraries



LITHOGRAPHA TESSERATA Nyl.

a. Plant on rock. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecium. *e*. Ascus and paraphysis. *f*. Spores.

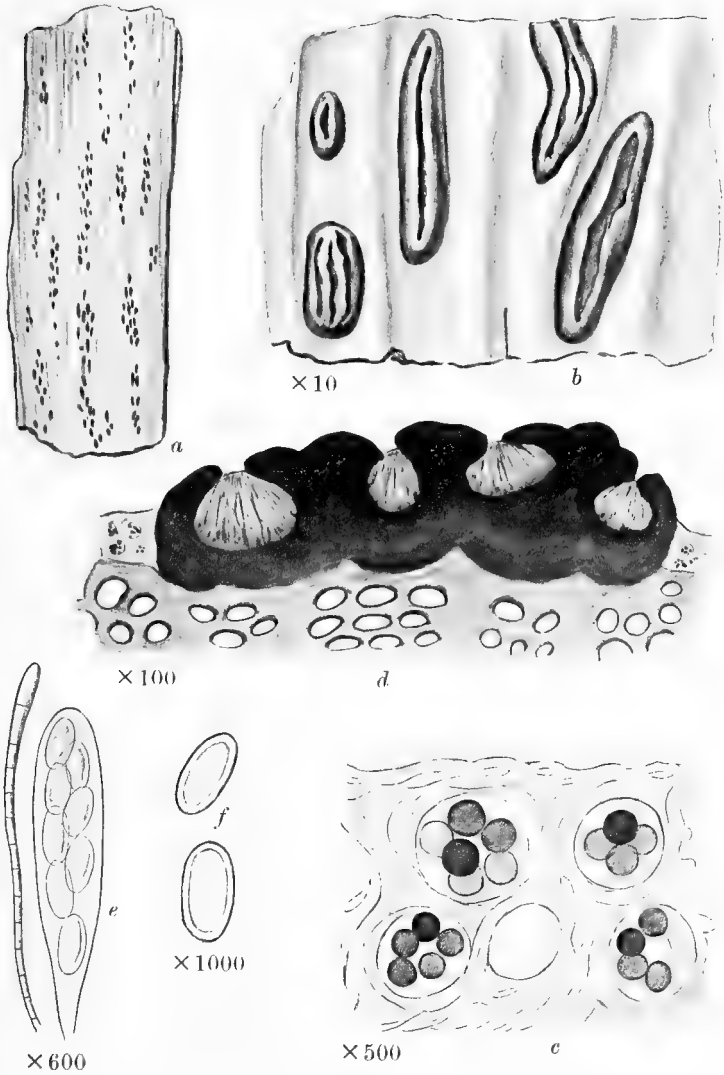
Cornell University Library



XYLOGRAPHA PARALLELA Nyl.

a. Plant on wood. *b*. Protruding apothecia. *c*. Vertical section of thallus and apothecium. *d*. Ascus and paraphysis. *e*. Spore.

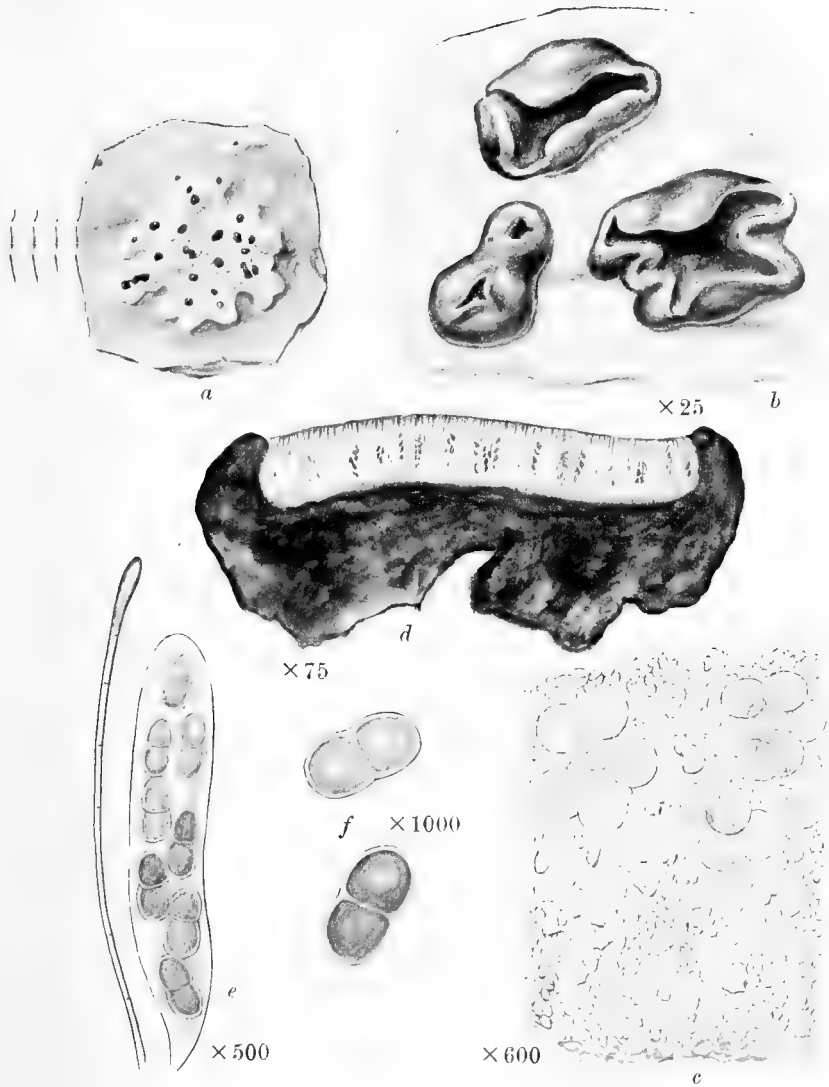
Cornell University Library



PTYCHOGRAPHA XYLOGRAPHOIDES Nyl.

a. Plant on wood. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecia. *e*. Ascus and paraphysis. *f*. Spores.

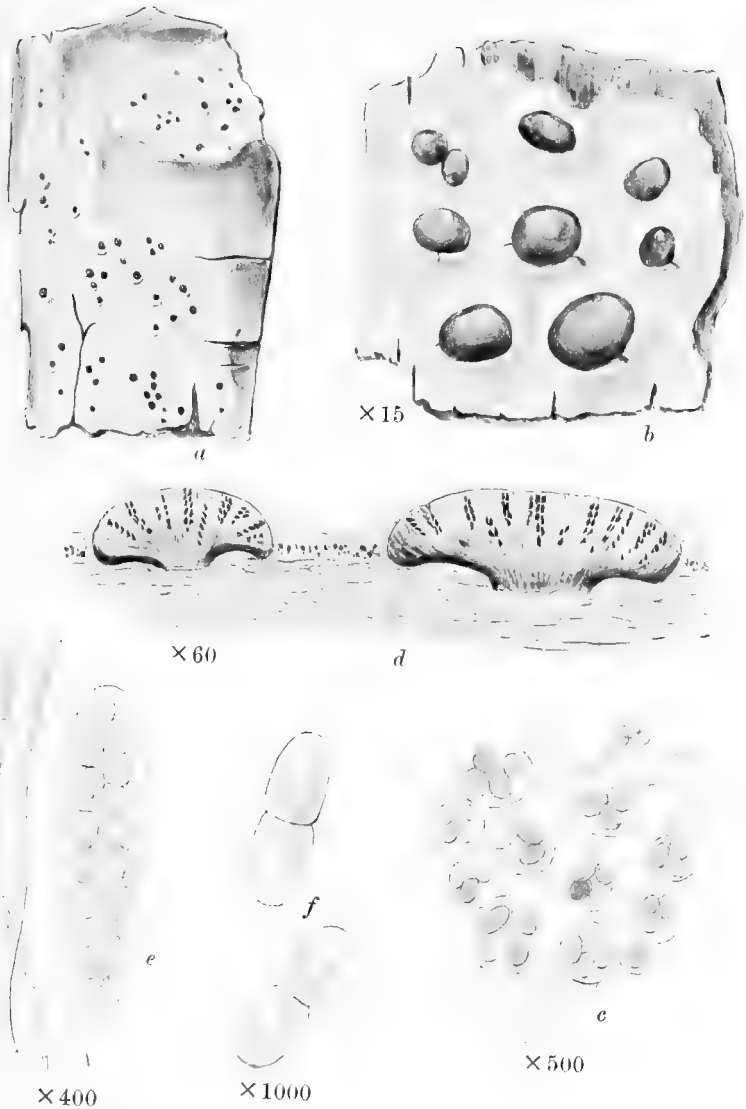
Cornell University Library



ENCEPHALOGRAPHA CEREBRINA Koerb.

a. Plant on rock. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecium. *e*. Ascus and paraphysis. *f*. Spores.

Cornell University Library



MELASPILEA PROXIMELLA Nyl.

a. a. a. a. Plant on bark of thallus. *b.* Portion of thallus and apothecia. *c.* Vertical section of thallus. *d.* Vertical section of apothecia. *e.* Ascus and paraphyses. *f.* Spores.

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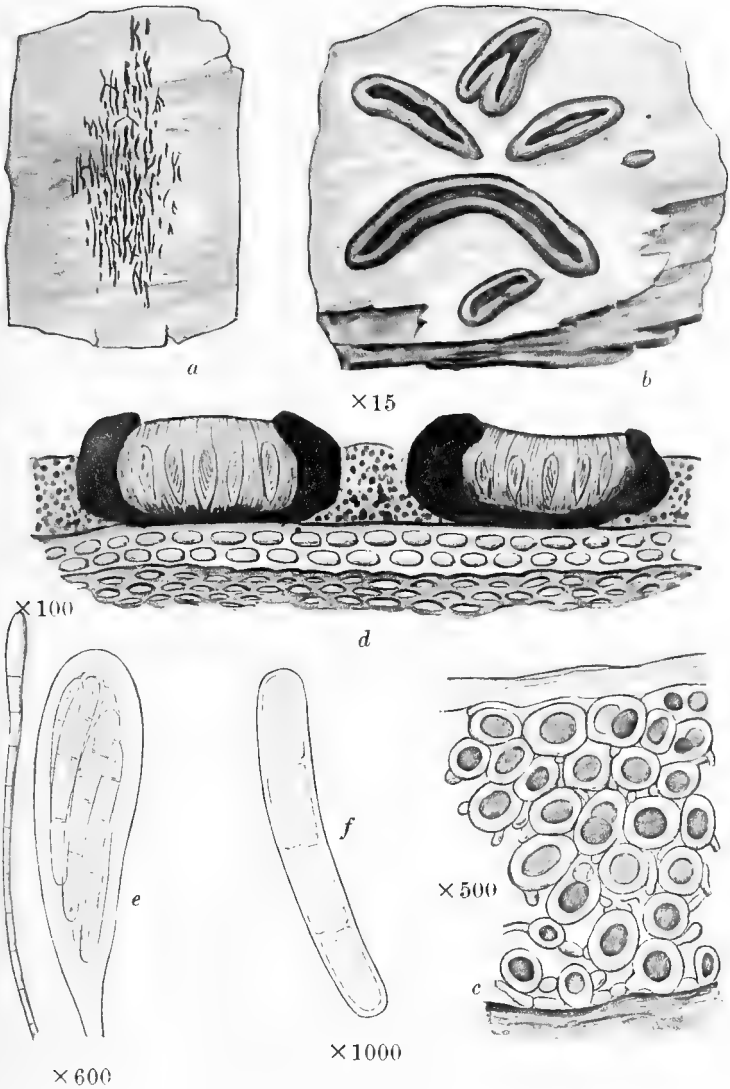
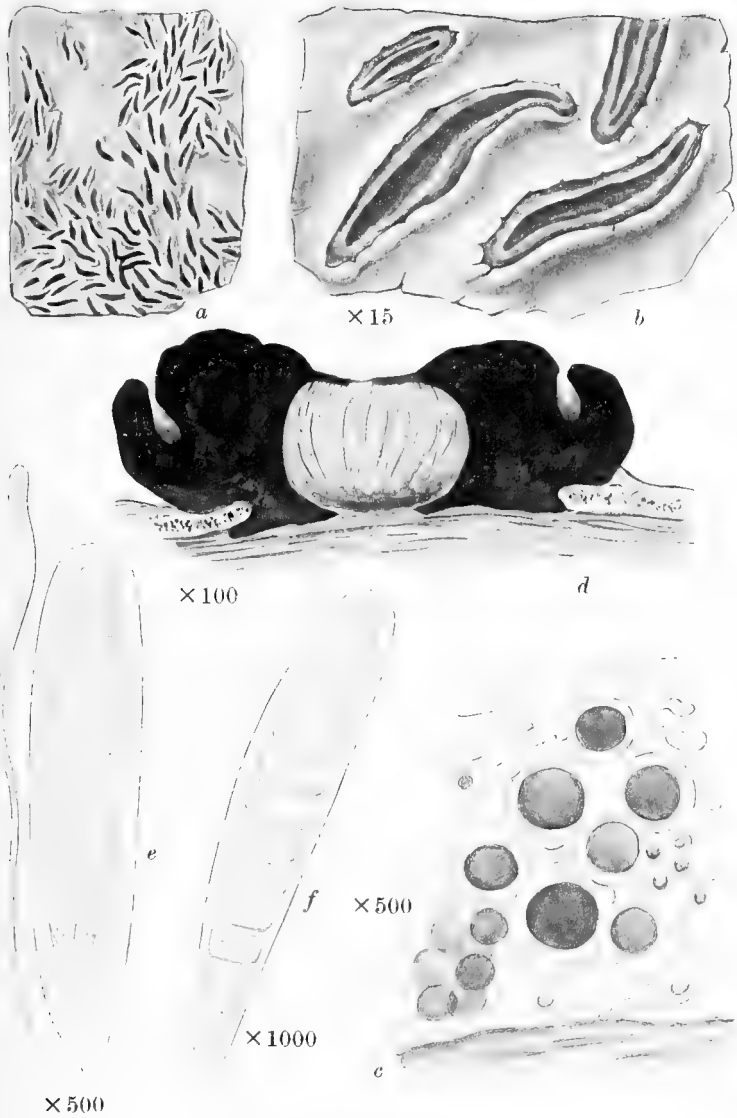


OPEGRAPHA ATRA Pers.

a. Plant on bark. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecia. *e*. Ascus and paraphysis. *f*. Spore.

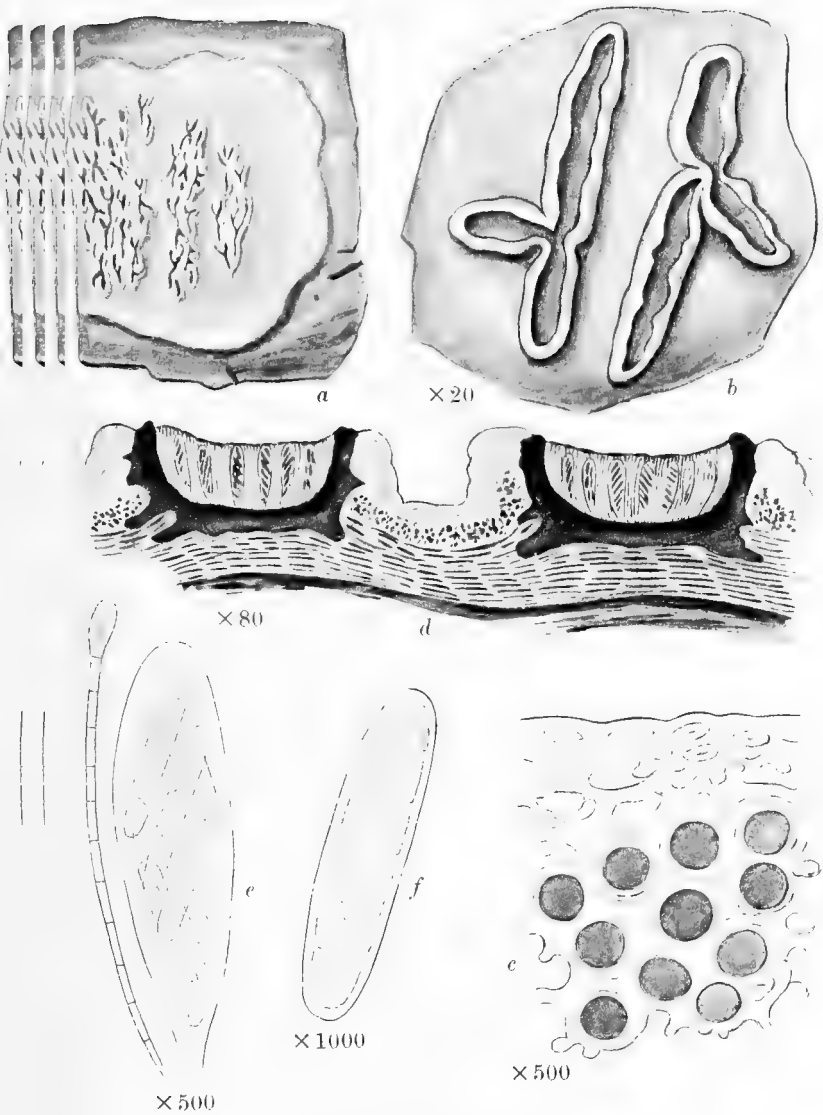
Cornell University Library



GRAPHIS ELEGANS Ach.

a. Plant on bark. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecium. *e*. Ascus and paraphysis. *f*. Spore.

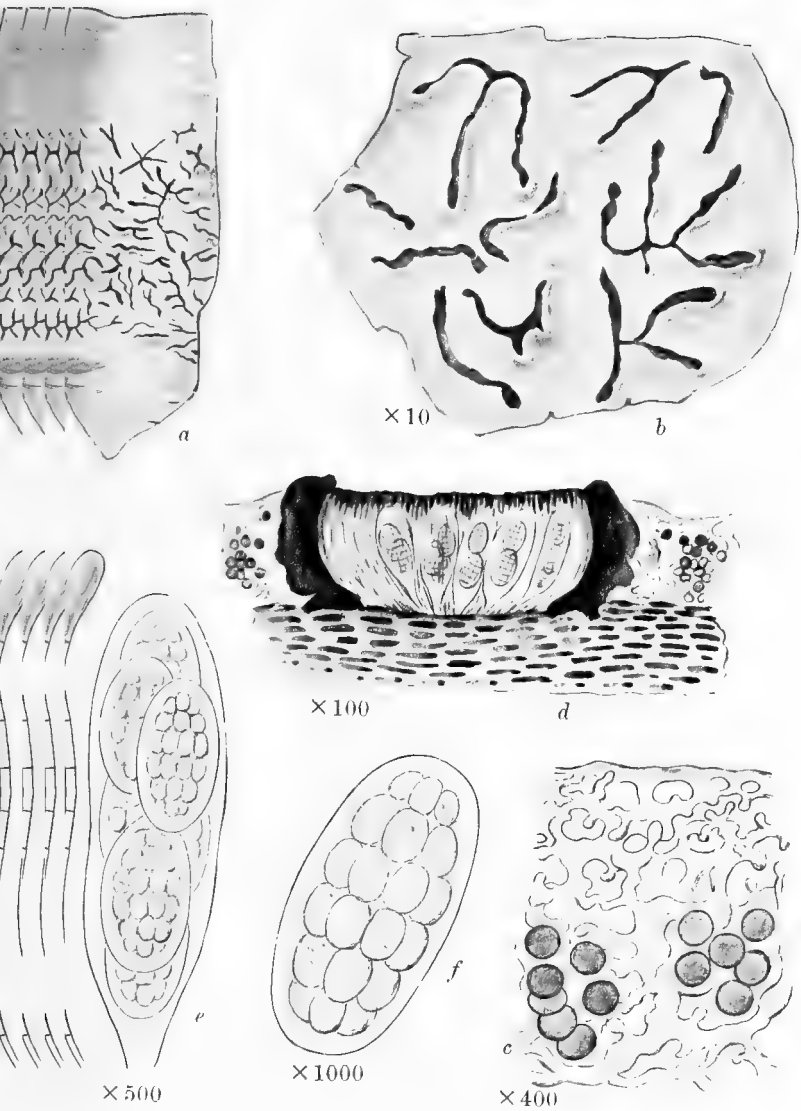
Cornell University Library



PHÆOGRAPHIS LYELLII A. Zahlbr.

a. Plant on bark. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecia. *e*. Ascus and paraphysis. *f*. Spore.

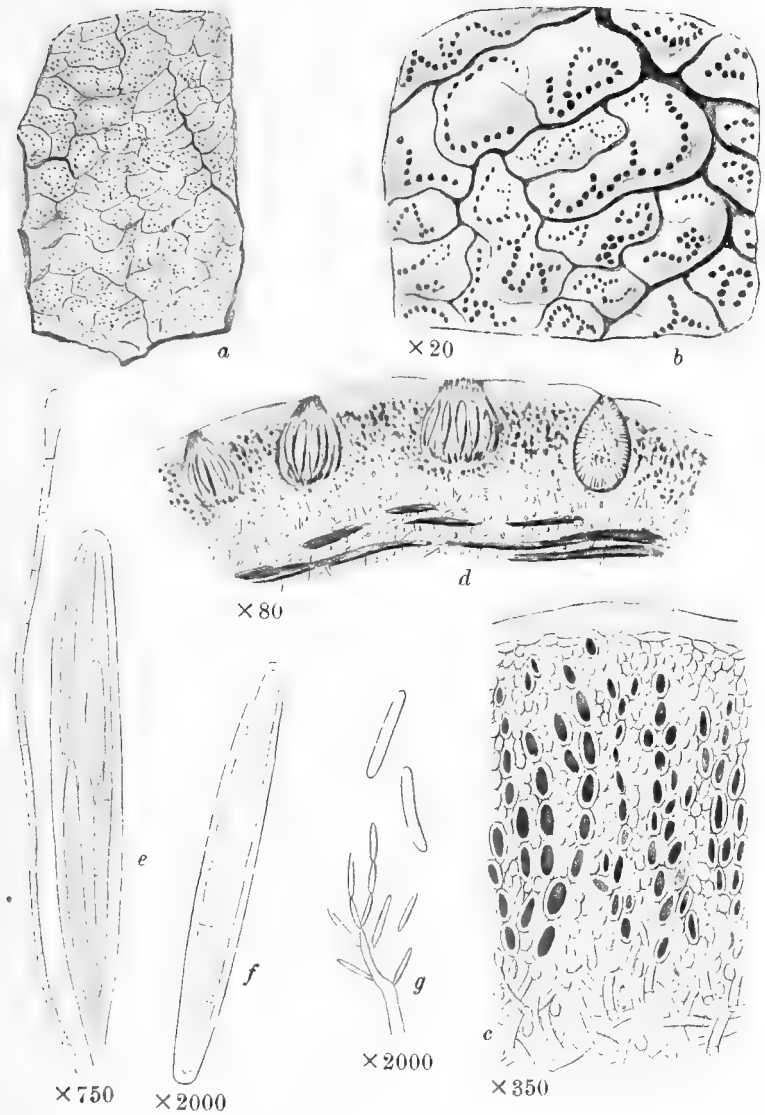
Cornell University Libraries



GRAPHINA SOPHISTICA Muell. Arg.

a. a. a. a. Plant on bark. *b.* Portion of thallus and apothecia. *c.* Vertical section of of o of thallus. *d.* Vertical section of apothecium. *e.* Ascus and paraphysis. *f.* Spore.

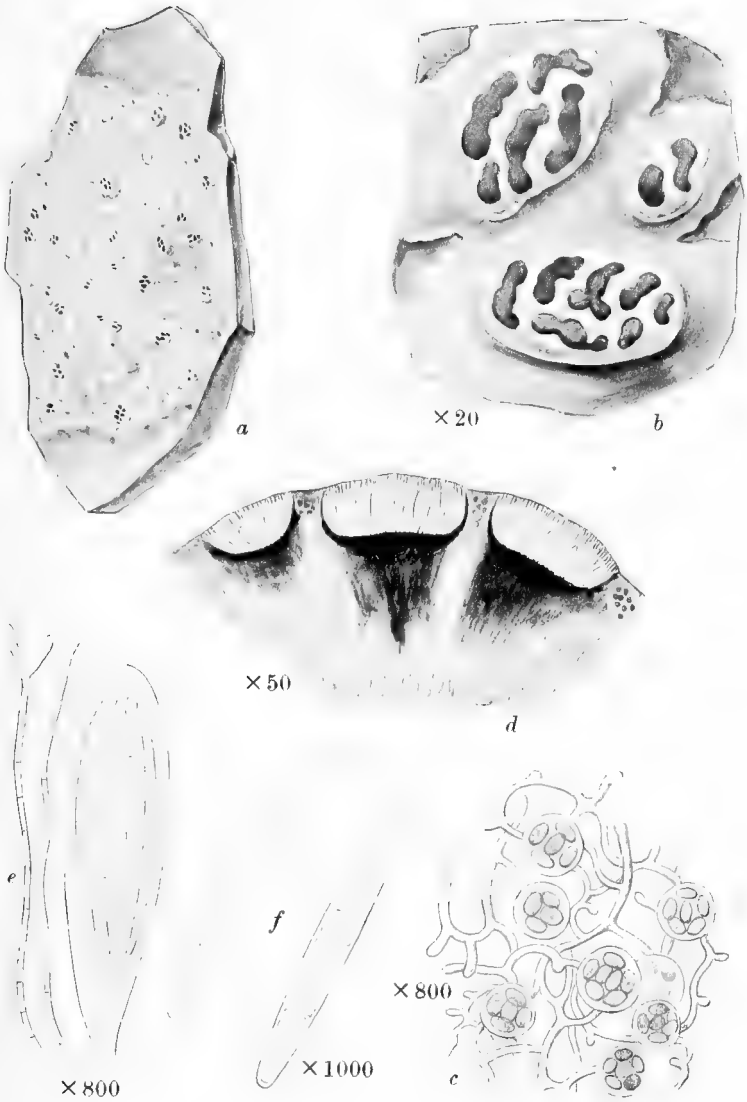
Cornell University Library



ENTEROGRAPHA CRASSA Fée

a. Plant on bark. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecia and spermogone. *e*. Ascus and paraphysis. *f*. Spore. *g*. Sterigma and spermatia.

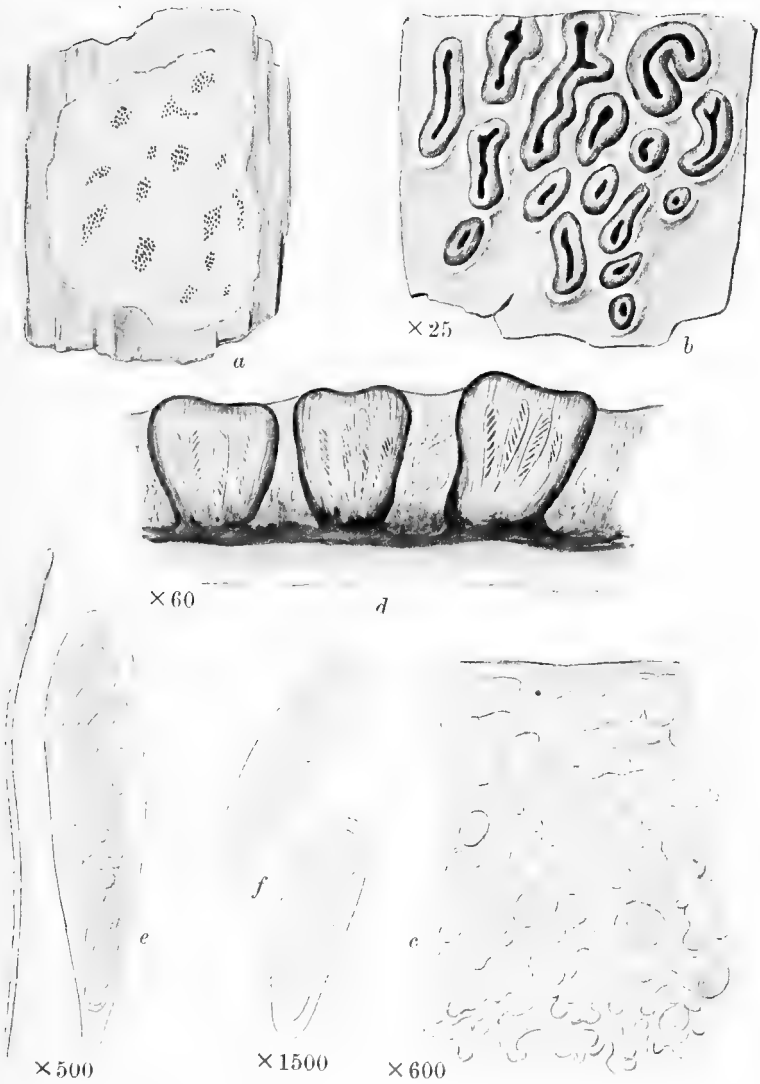
Cornell University Library



CHIODECTON ALBIDUM Leight.

a. Plant on rock. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecia. *e*. Ascus and paraphyses. *f*. Spores.

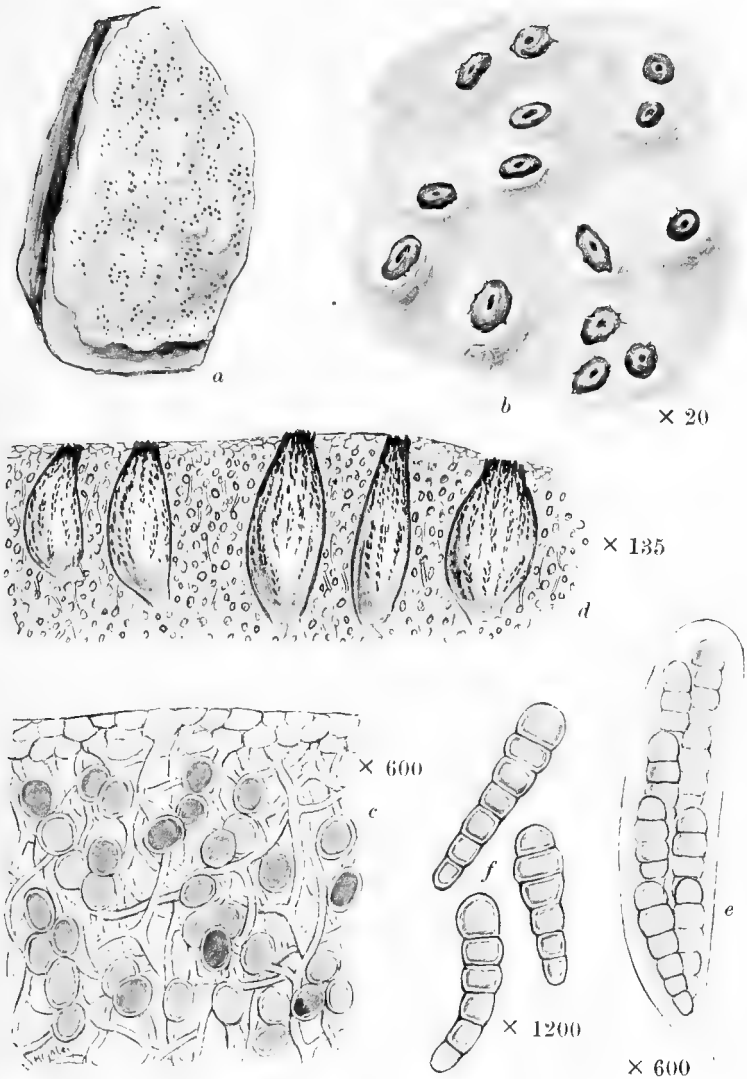
Cornell University Library



GLYPHIS LABYRINTHICA Ach.

a. Plant on bark. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecia. *e*. Ascus with paraphysis. *f*. Spores.

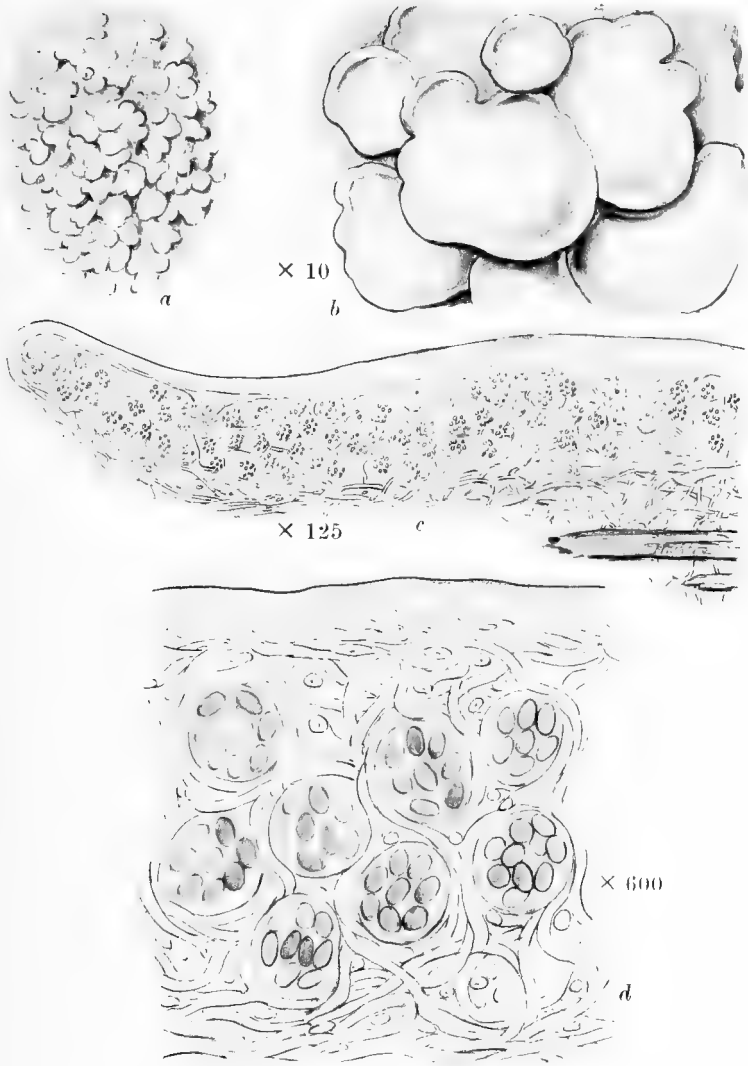
Cornell University Library



SCLEROPHYTON CIRCUMSCRIPTUM A. Zahlbr.

a. Whole plant. *b*. Portion of thallus and apothecia. *c*. Vertical section of thallus. *d*. Vertical section of apothecia. *e*. Ascus. *f*. Spores.

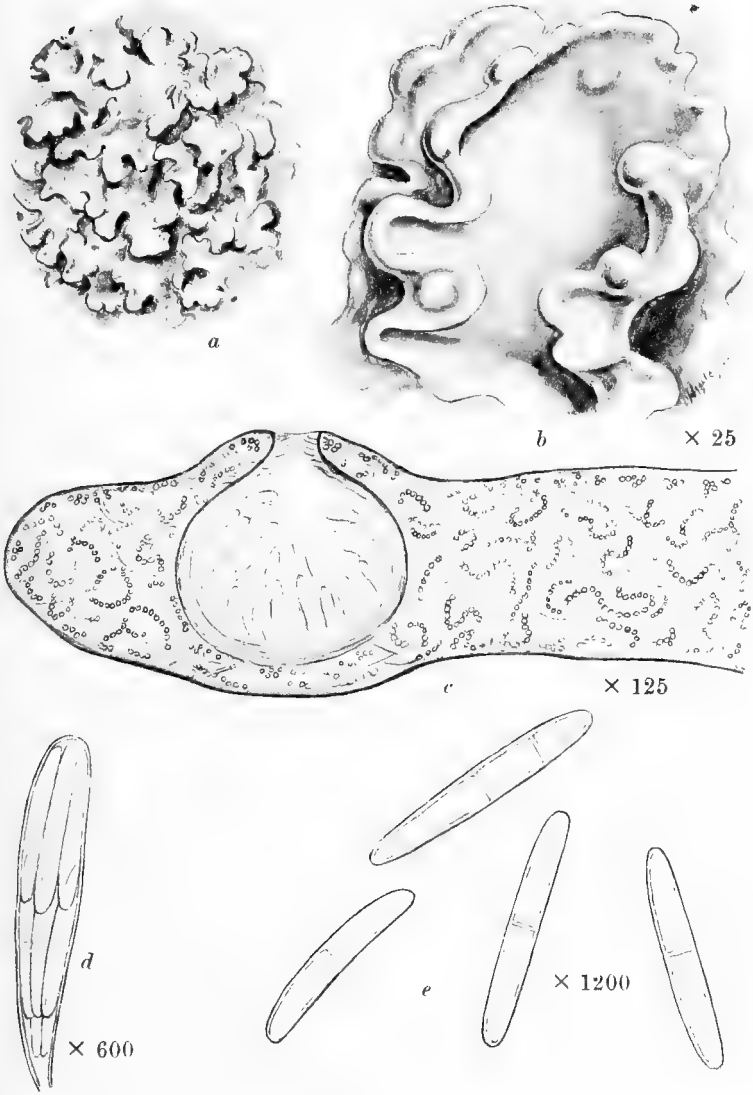
Cornell University Library



CORISCIUM VIRIDE Wainio.

a. Whole plant. *b*. Portion of thallus. *c*. Vertical section of thallus. *d*. Vertical section of thallus.

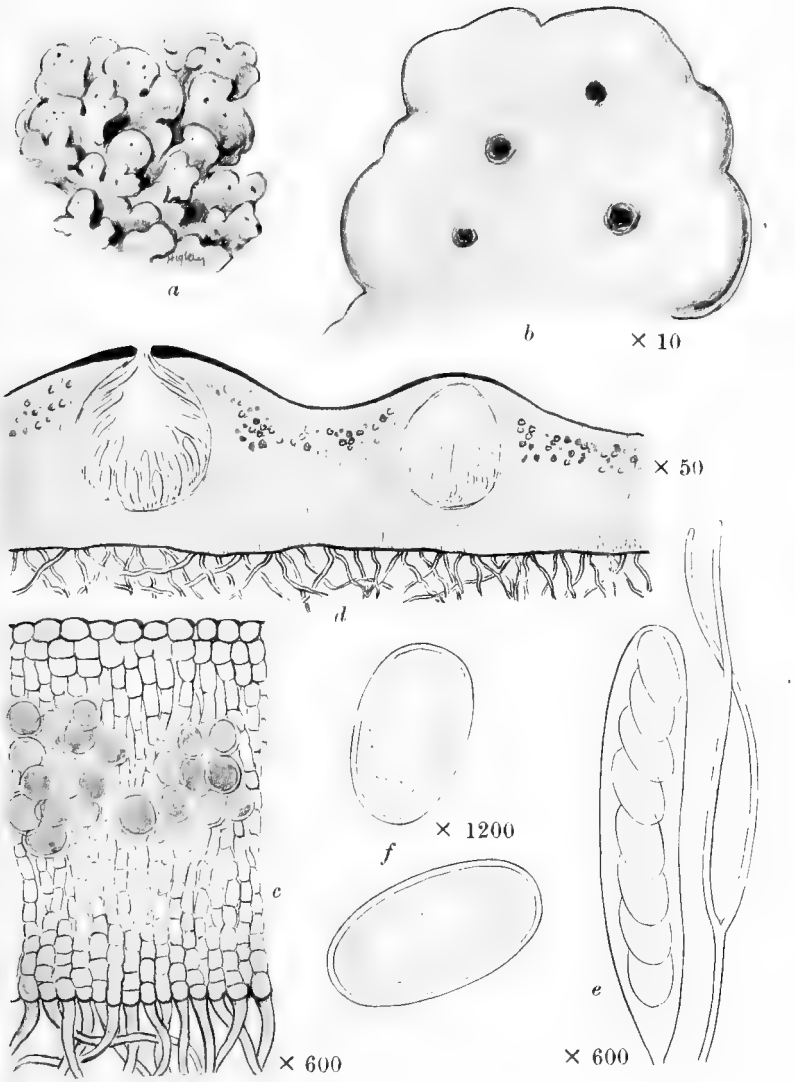
Cornell University Libraries



OBRYZUM DOLICHOTERON Nyl.

a. Host plant (*Collema*) with parasite. *b*. Lobe of *Collema* with perithecia of parasite. *c*. Vertical section of perithecium and of host thallus. *d*. Ascus. *e*. Spores.

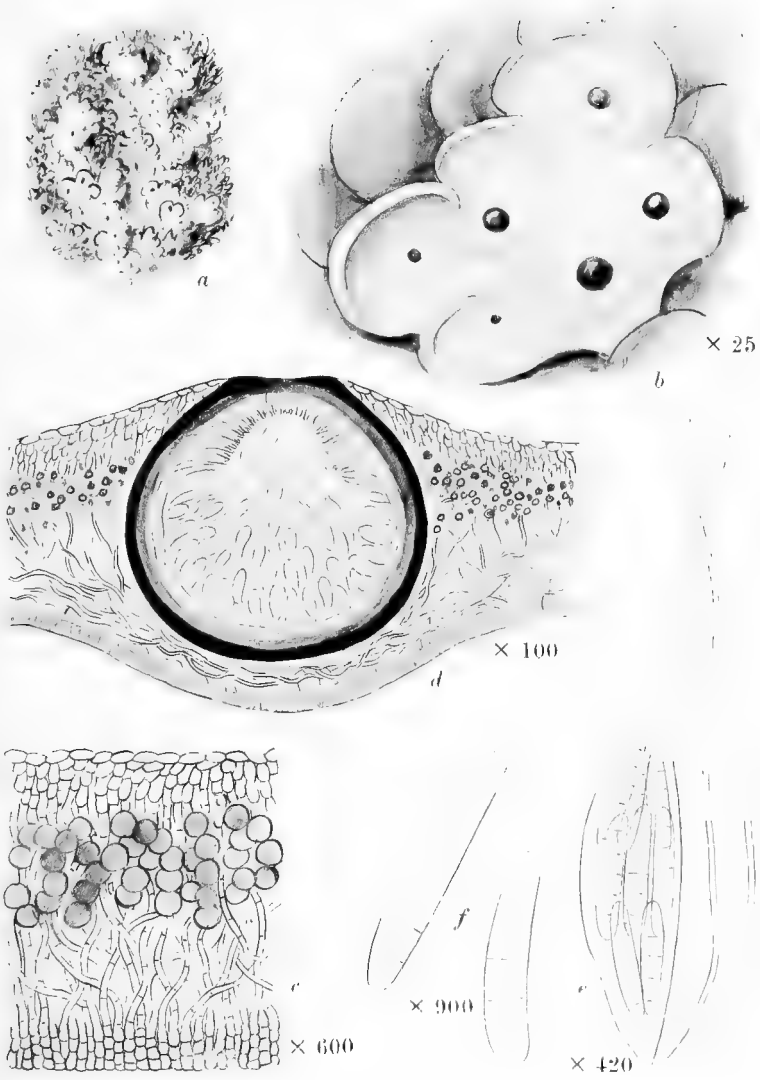
Cornell University Library



DERMATOCARPON LACHNEUM A. L. Sm.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Vertical section of perithecia. *e*. Ascus and paraphysis. *f*. Spores.

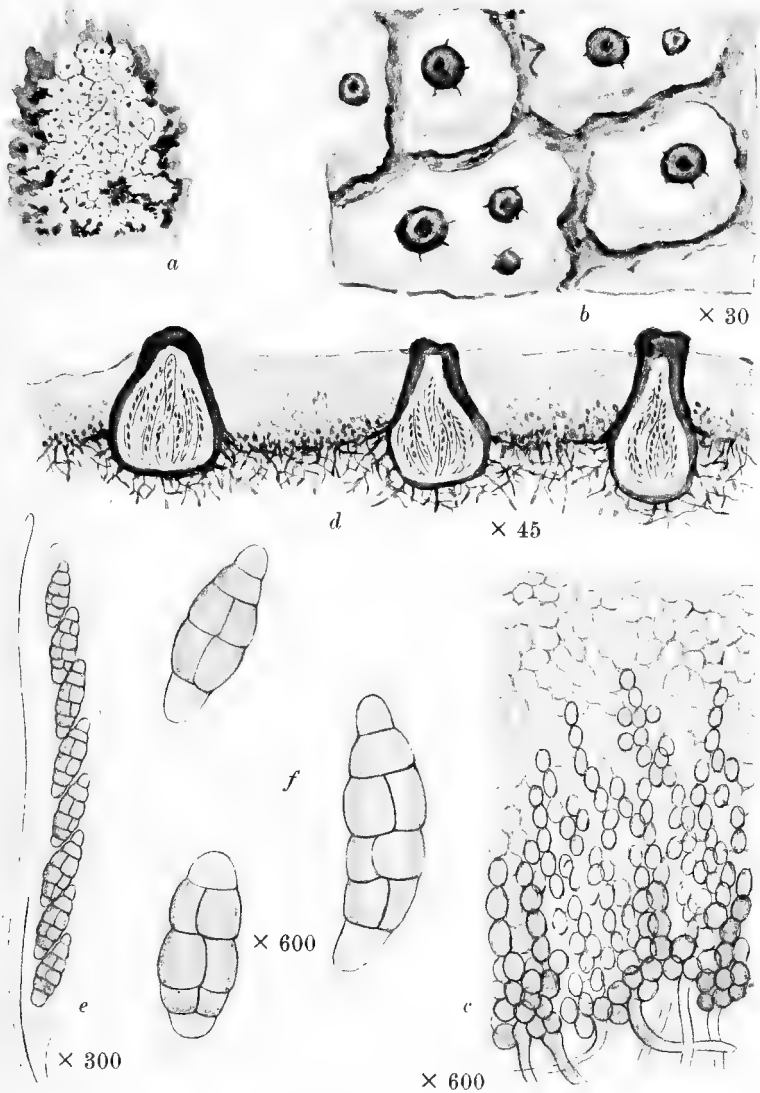
Cornell University Libraries



NORMANDINA PULCHELLA Cromb.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Vertical section of perithecium. *e*. Ascus and paraphyses. *f*. Spores.

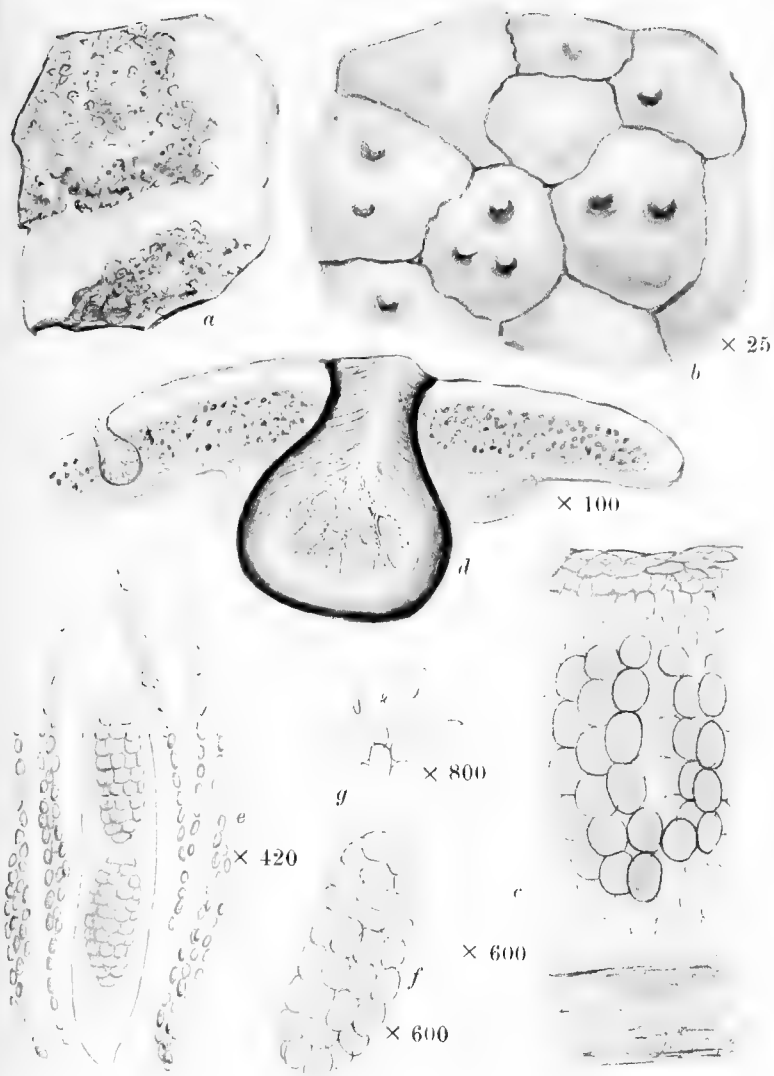
Cornell University Library



DACAMPIA HOOKERI Massal.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Vertical section of perithecia. *e*. Ascus and paraphysis. *f*. Spores.

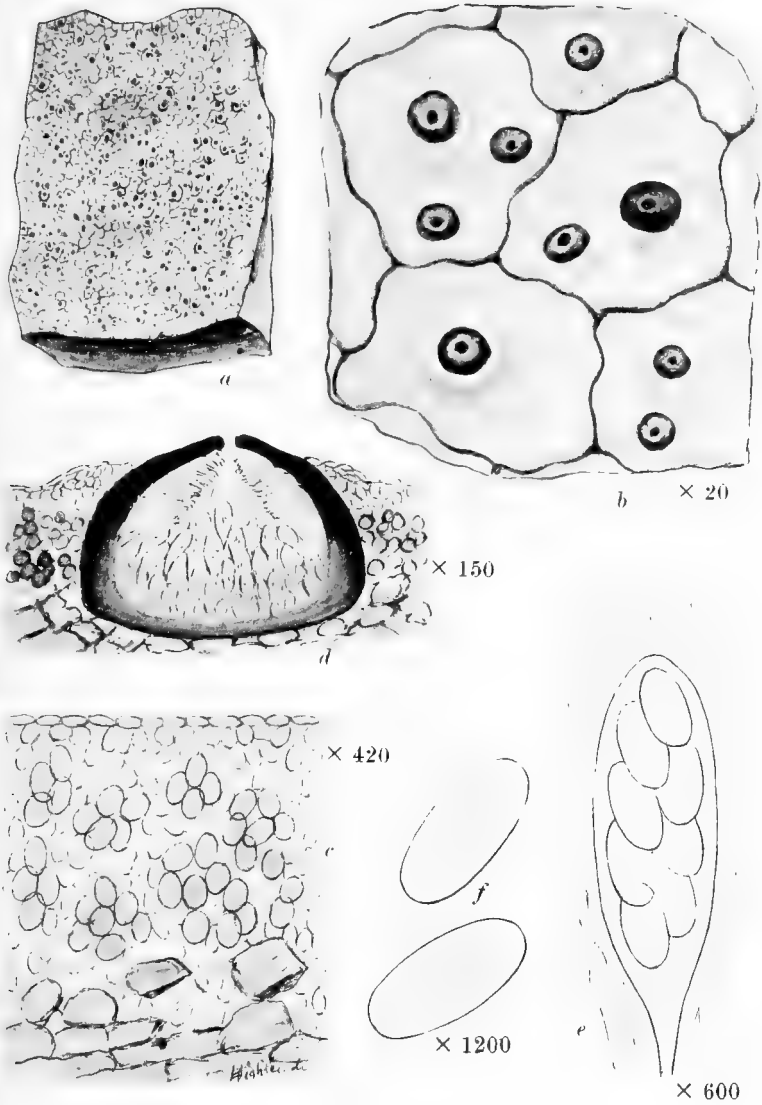
Cornell University Libraries



ENDOCARPON PUSILLUM Hedw.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Vertical section of perithecium and spermogonium. *e*. Ascus and hymenial gonidia. *f*. Spore. *g*. Sterigmata and spermatia.

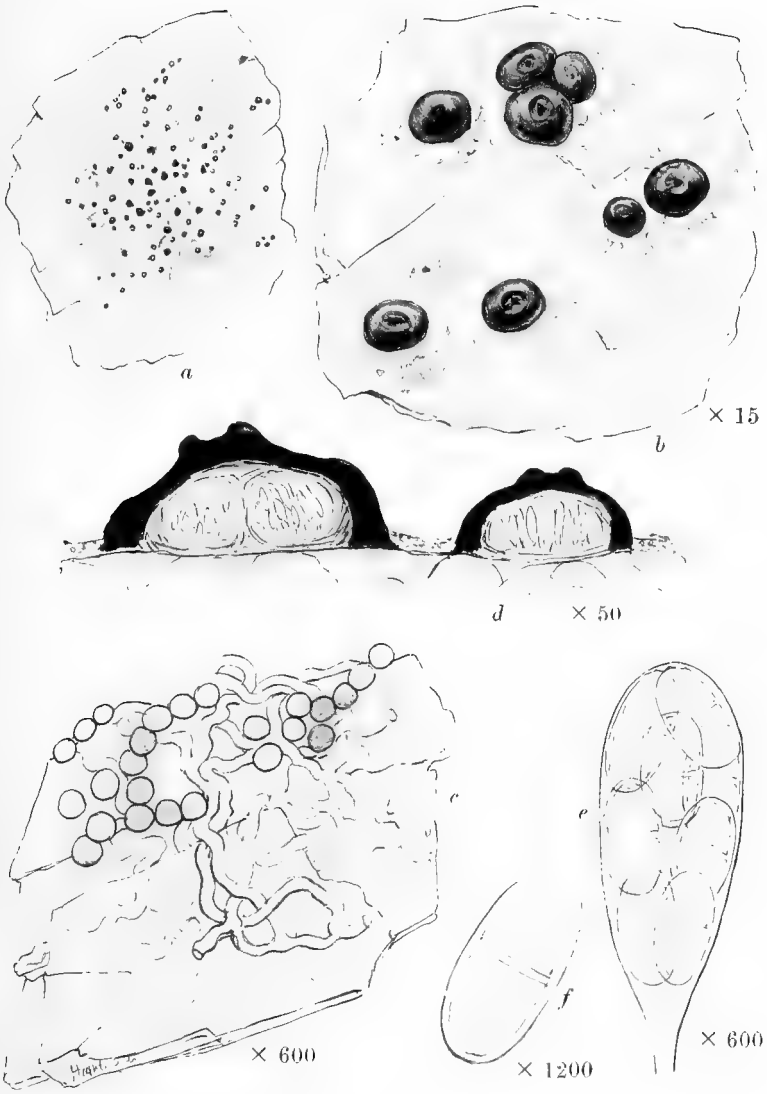
Cornell University Libraries



VERRUCARIA PAPILLOSA Ach.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Vertical section of perithecium. *e*. Ascus and paraphyses. *f*. Spores.

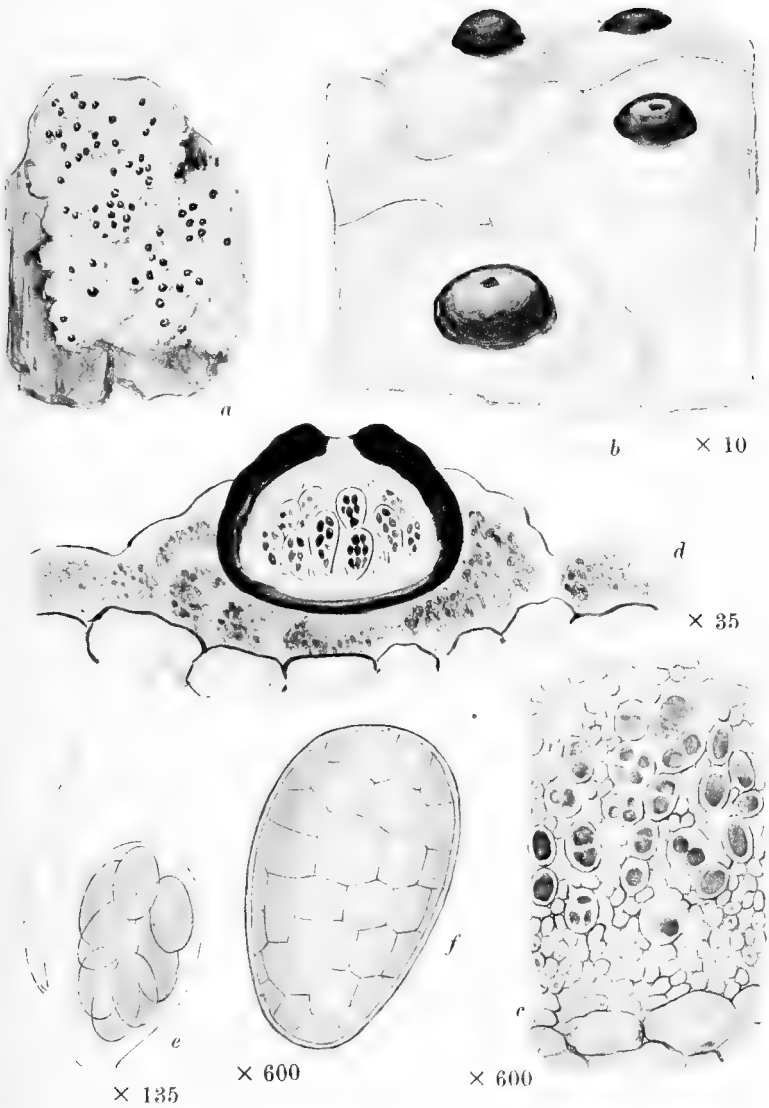
Cornell University Library



THELIDIUM PYRENOPHORUM Koerb.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Thalline hyphæ and gonidia. *d*. Vertical section of perithecia. *e*. Ascus. *f*. Spore.

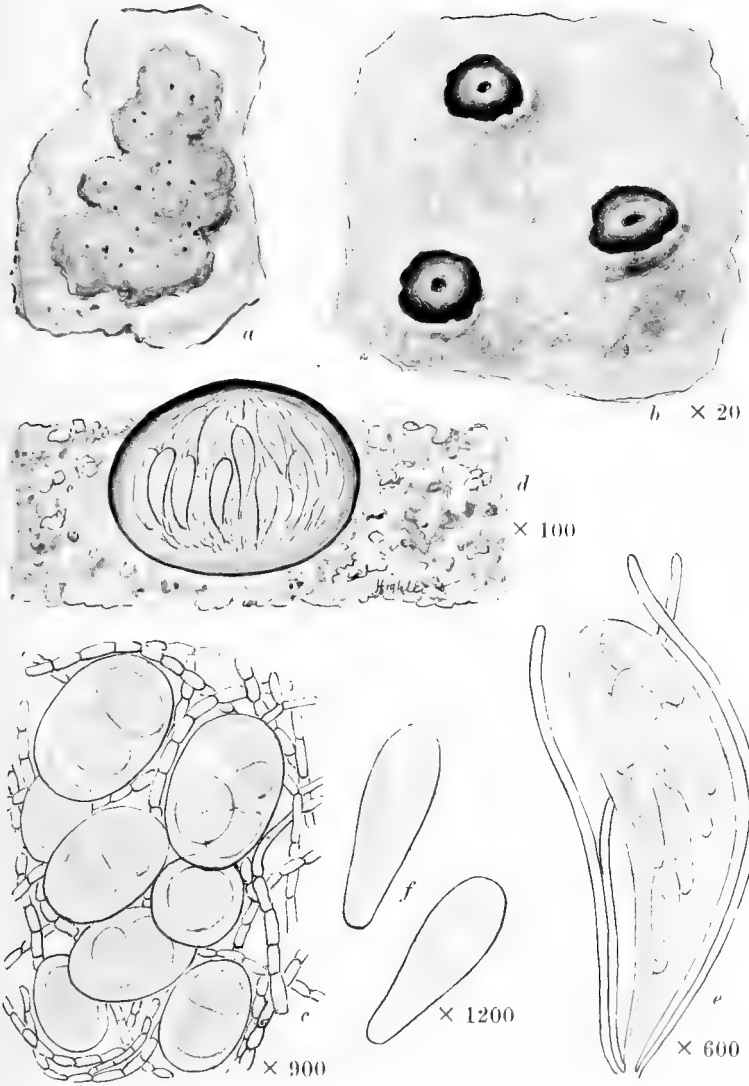
Cornell University Libraries



POLYBLASTIA THELEODES Th. Fr.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Vertical section of perithecium. *e*. Ascus and paraphysis. *f*. Spore.

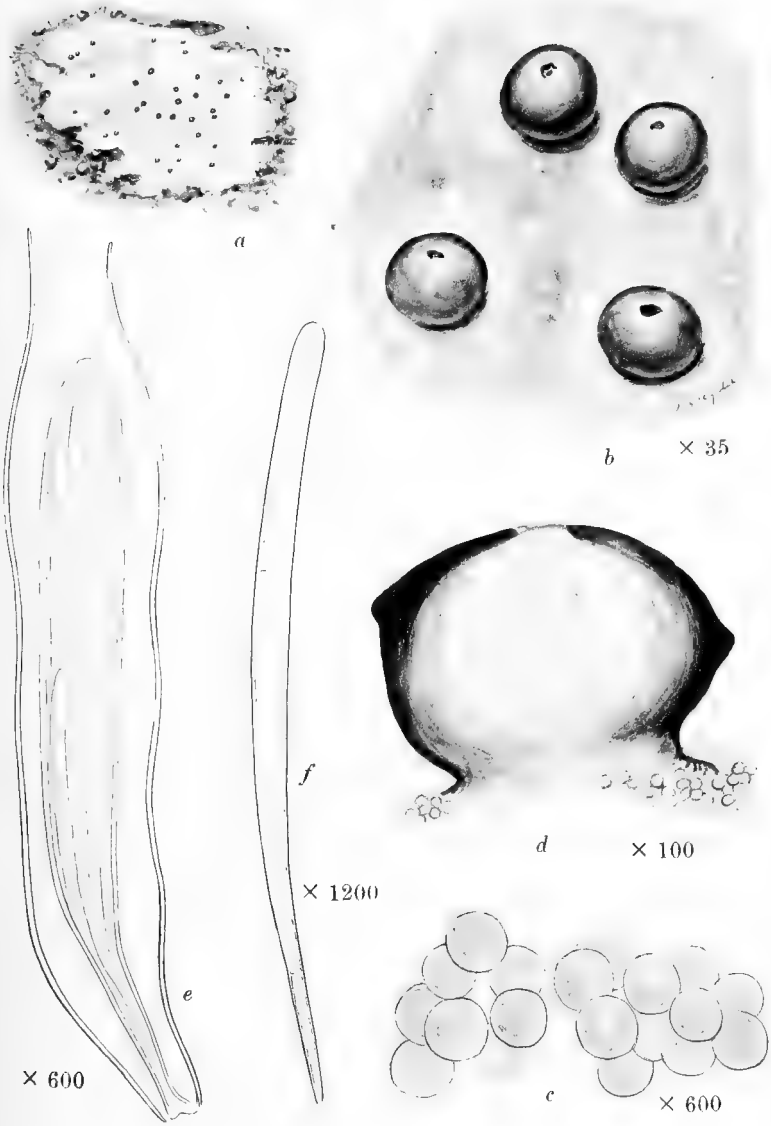
Cornell University Libraries



THROMBIUM EPIGÆUM Wallr.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Vertical section of perithecium. *e*. Ascus and paraphyses. *f*. Spores.

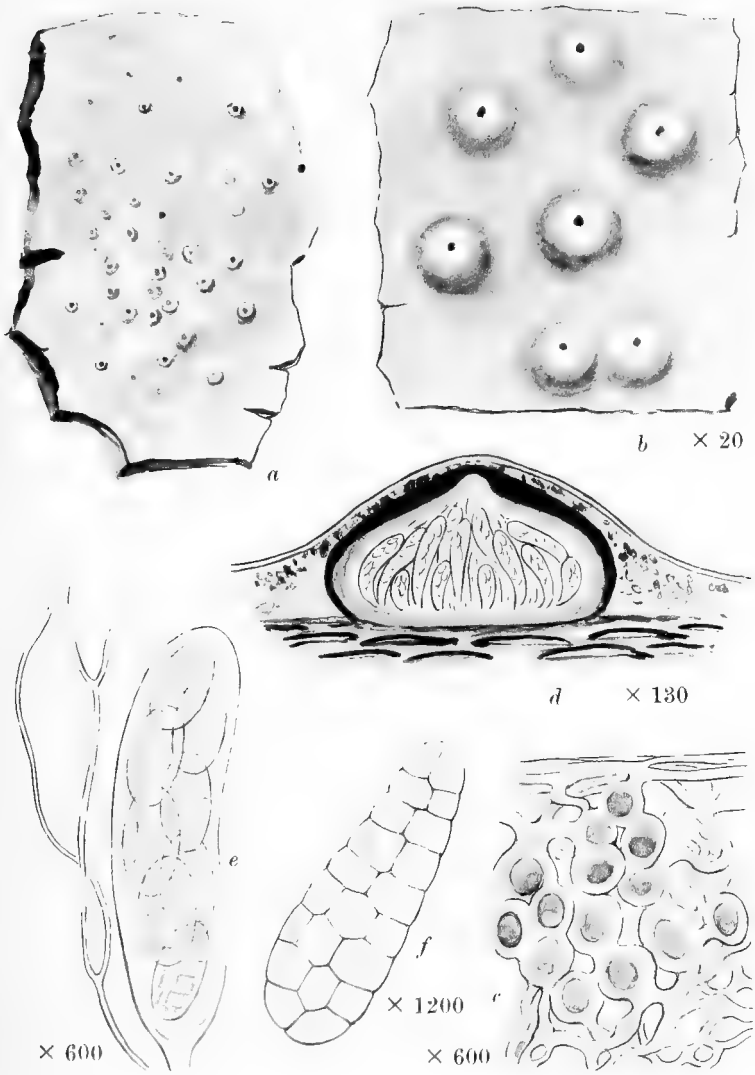
Cornell University Libraries



GONGYLIA VIRIDIS A. L. Sm.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Thalline gonidia. *d*. Vertical section of perithecium. *e*. Ascus and paraphyses. *f*. Spore.

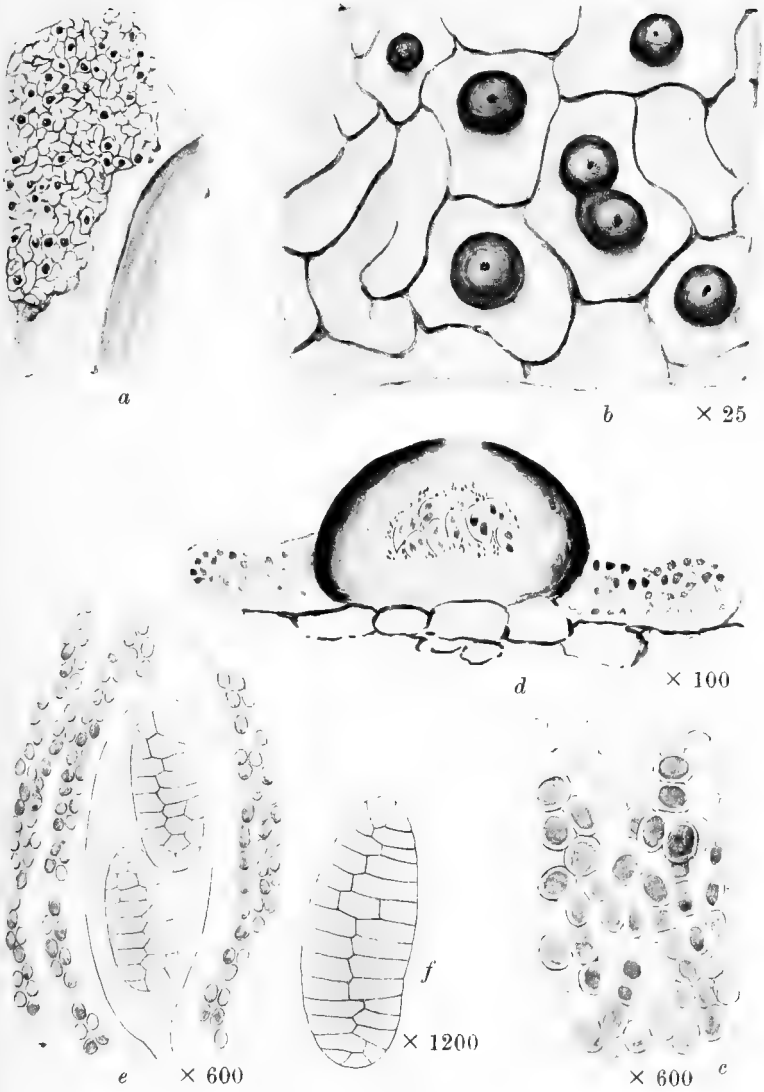
Cornell University Library



MICROGLAENA MODESTA A. L. Sm.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Vertical section of perithecium. *e*. Ascus and paraphysis. *f*. Spore.

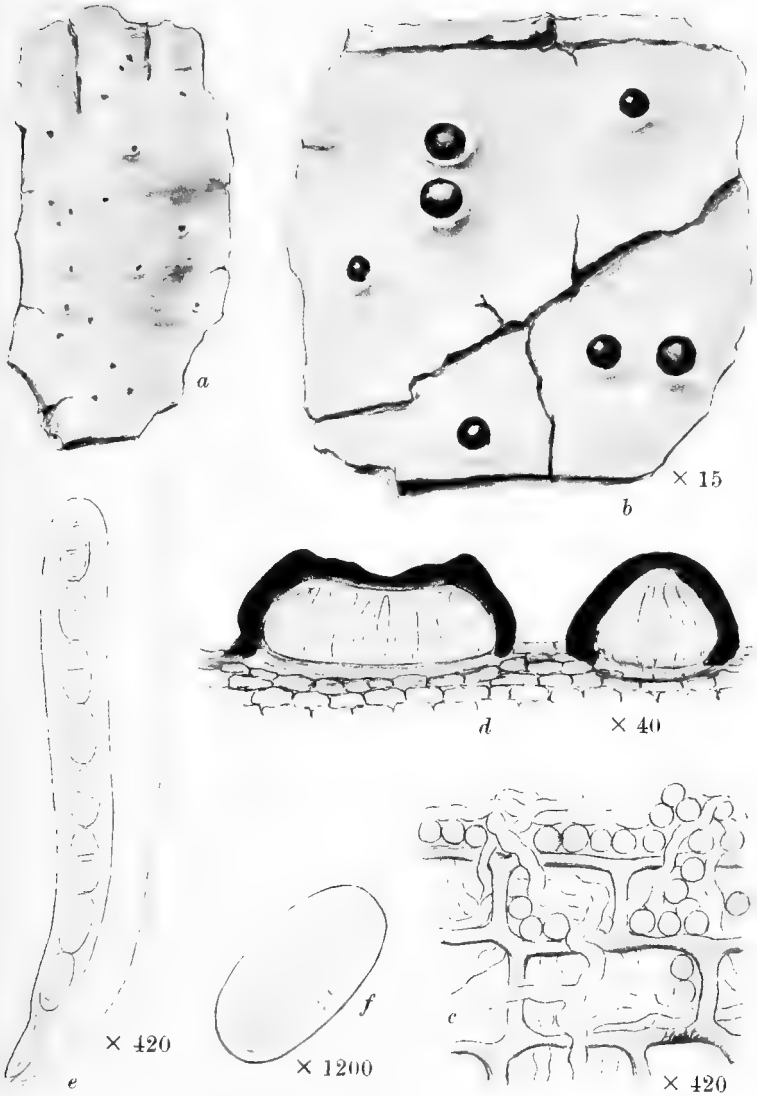
Cornell University Library



STAUROTHELE UMBRINUM A. L. Sm.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Vertical section of perithecium. *e*. Ascus and hymenial gonidia. *f*. Spore.

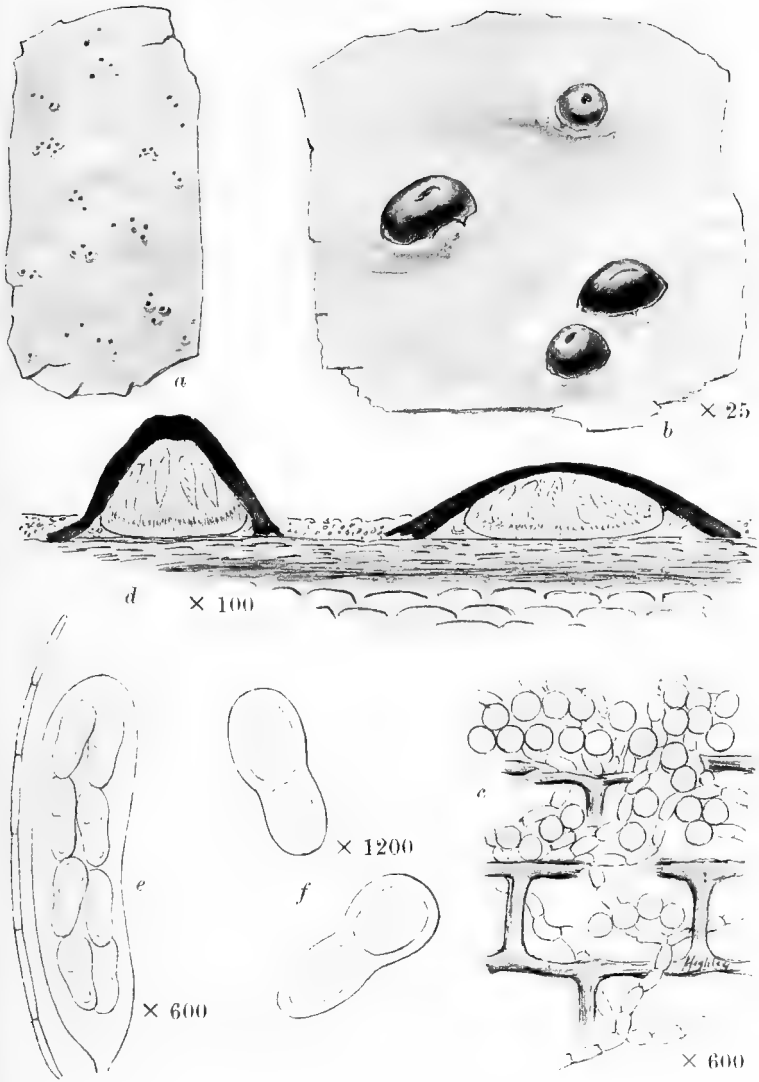
Cornell University Library



ACROCORDIA GEMMATA Koerb.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Vertical section of perithecia. *e*. Ascus and paraphysis. *f*. Spore.

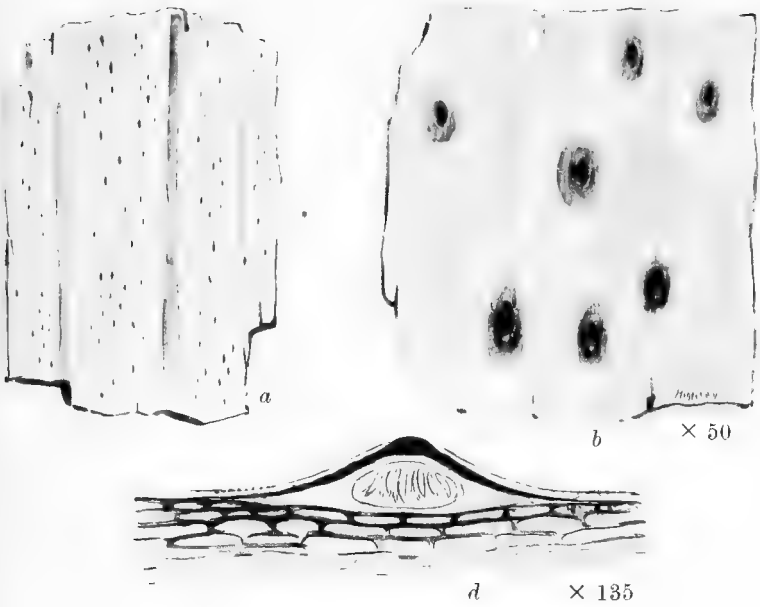
Cornell University Library

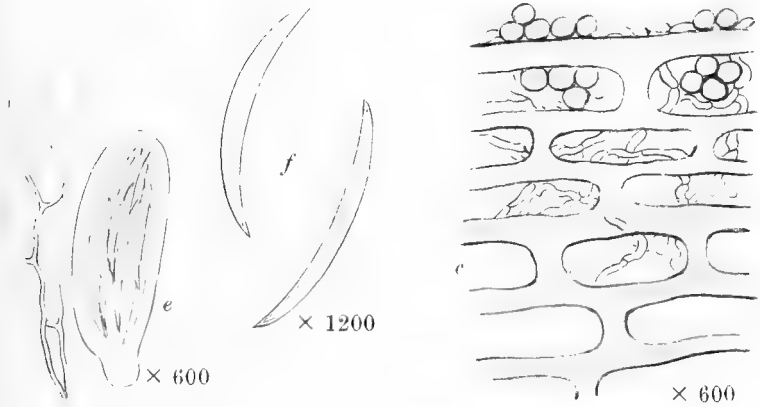


ARTHOPYRENIA FALLAX Arn.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Vertical section of perithecia. *e*. Ascus and paraphysis. *f*. Spores.

Cornell University Libraries

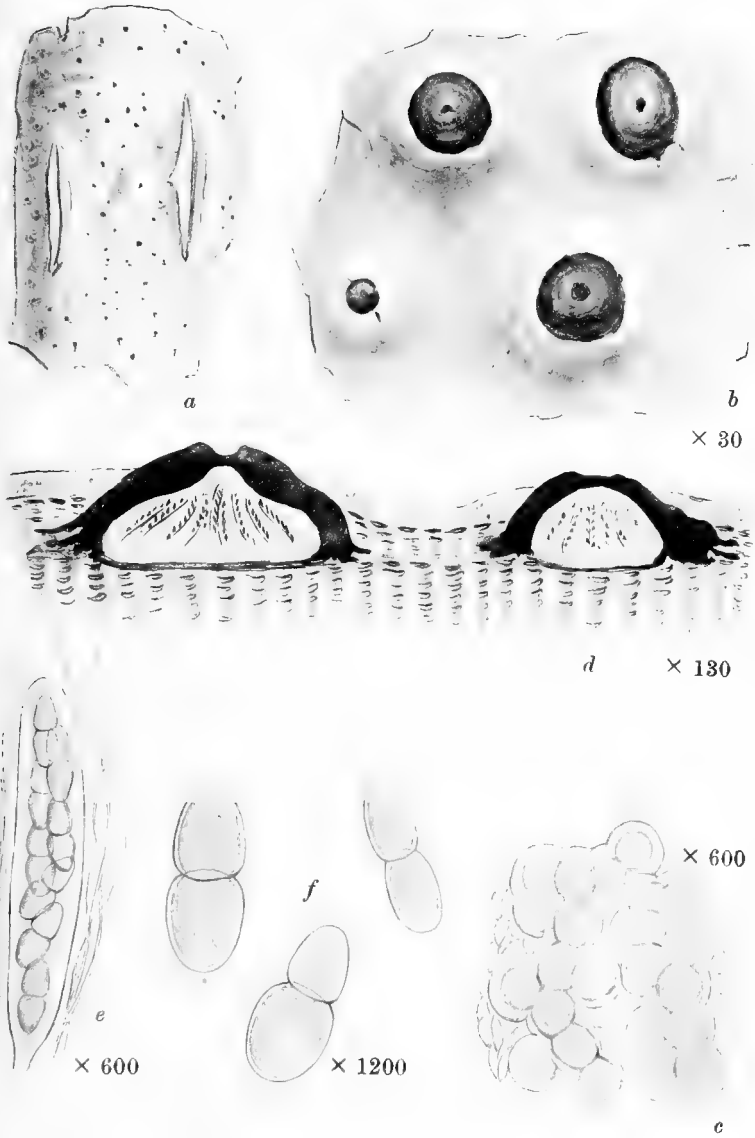




LEPTORHAPHIS EPIDERMIDIS Th. Fr.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Vertical section of perithecium. *e*. Ascus and paraphyses. *f*. Spores.

Cornell University Library



MICROTHELIA MICULA Flot.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Vertical section of perithecia. *e*. Ascus and paraphyses. *f*. Spores.

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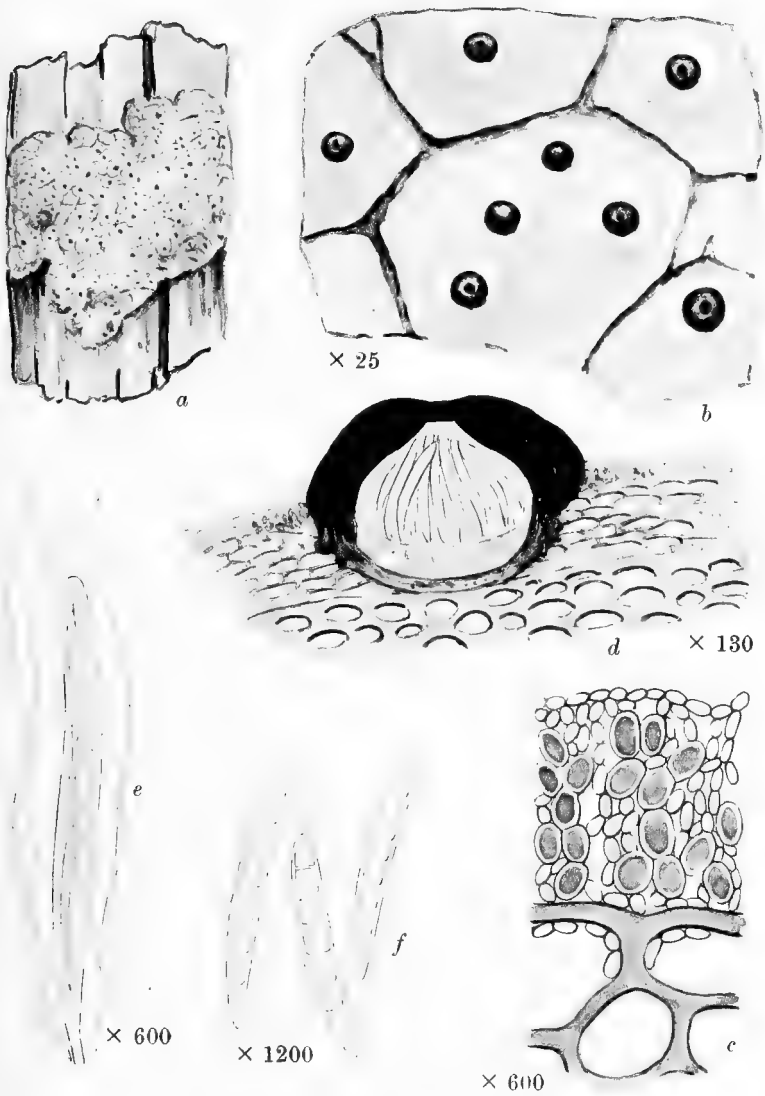

PORINA OLIVACEA A. L. Sm.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Vertical section of perithecium. *e*. Ascus and paraphyses. *f*. Spores.

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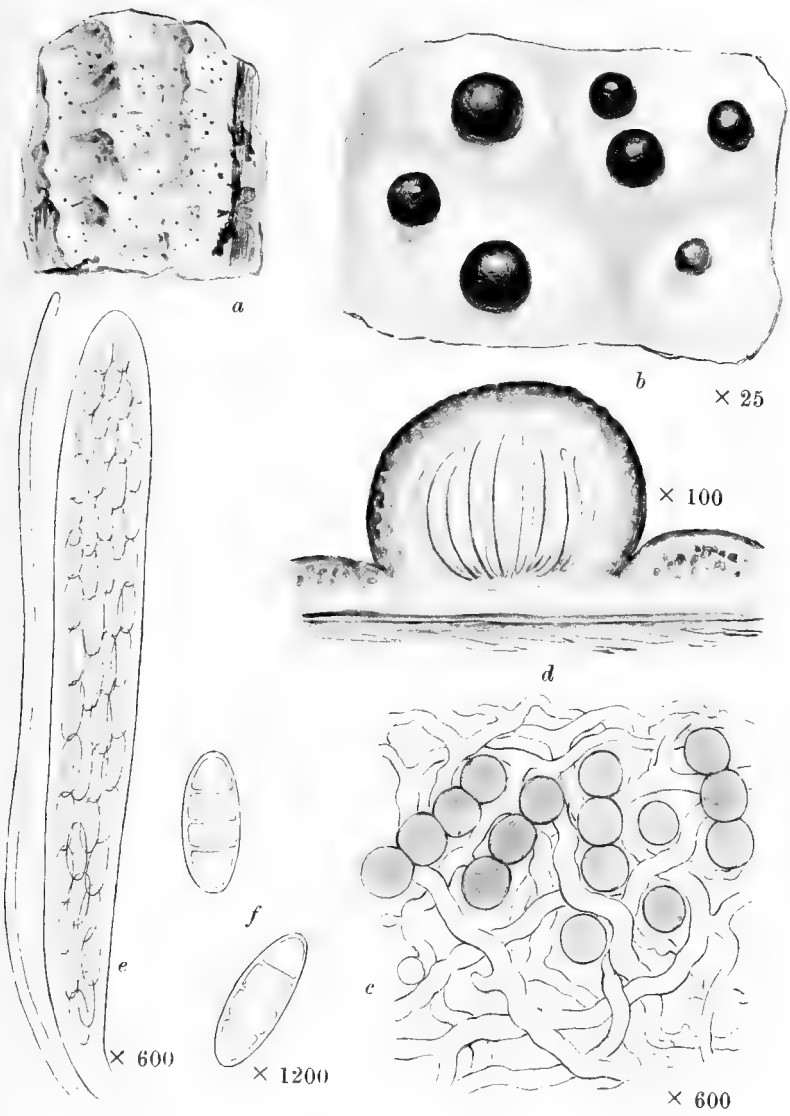

THELOPSIS RUBELLA Nyl.

a a a *a*. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Vertical section of perithecium. *e*. Ascus and paraphysis. *f*. Spores.

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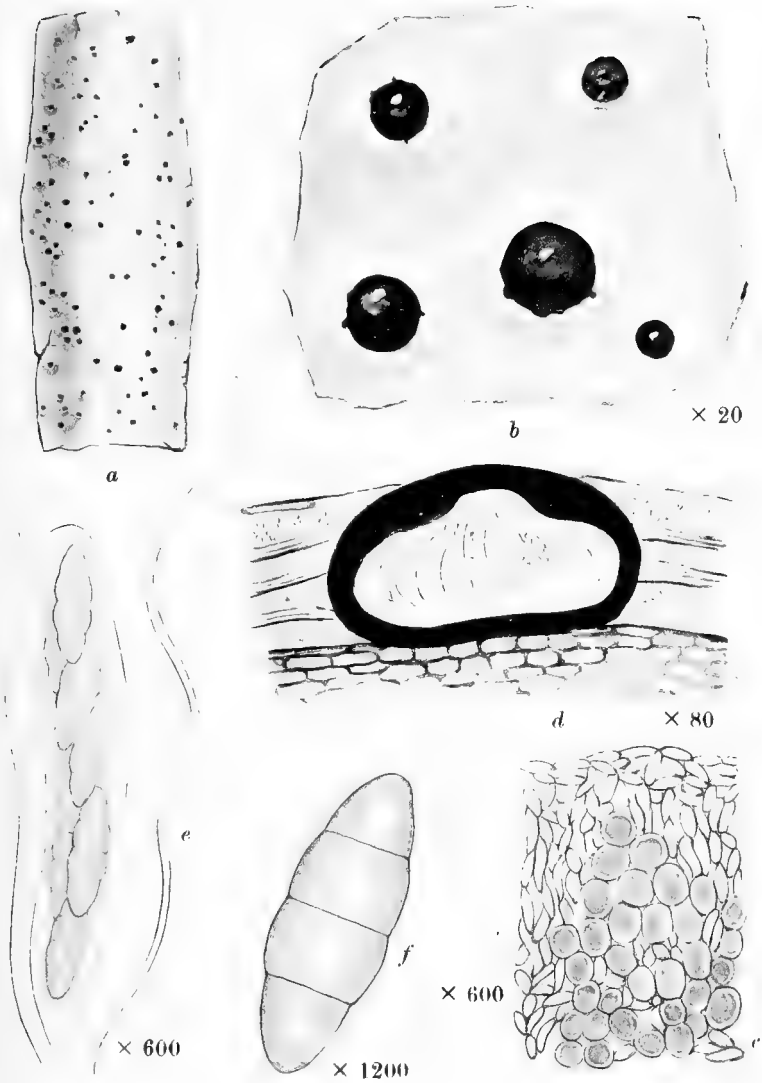

PYRENULA NITIDA Ach.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Vertical section of perithecium. *e*. Ascus and paraphyses. *f*. Spore.

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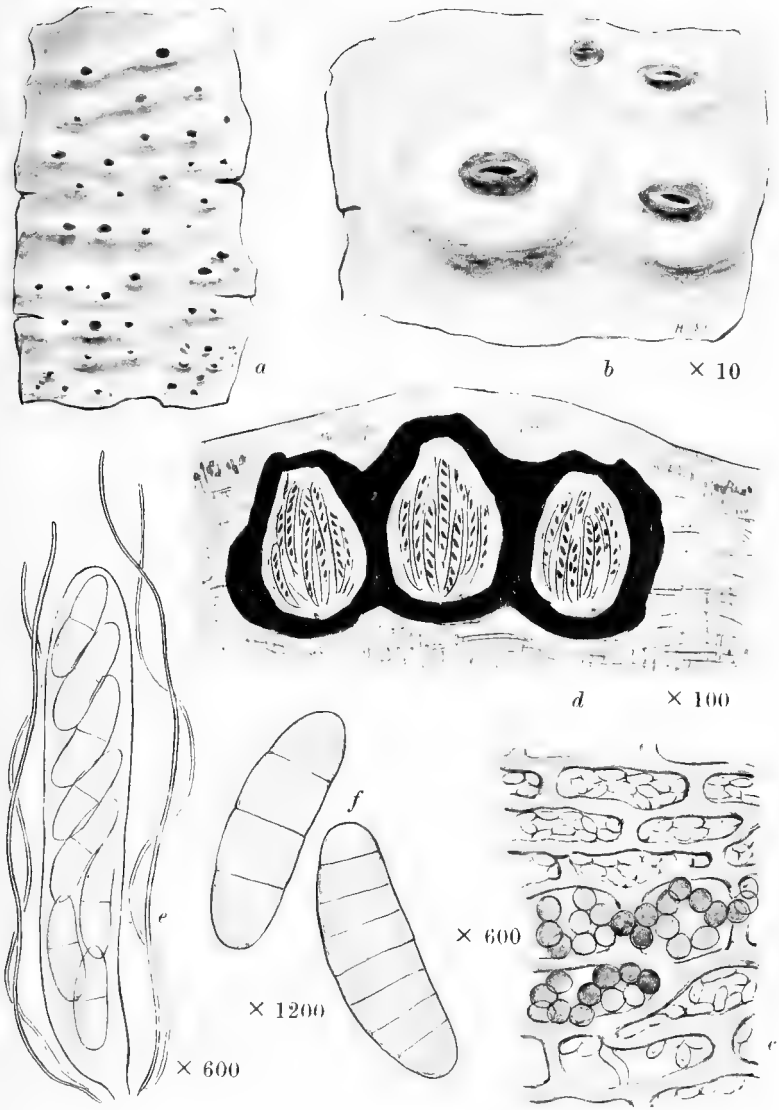

ANTHRACOTHECIUM HIBERNICUM A. L. Sm.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Vertical section of perithecia. *e*. Ascus and paraphyses. *f*. Spores.

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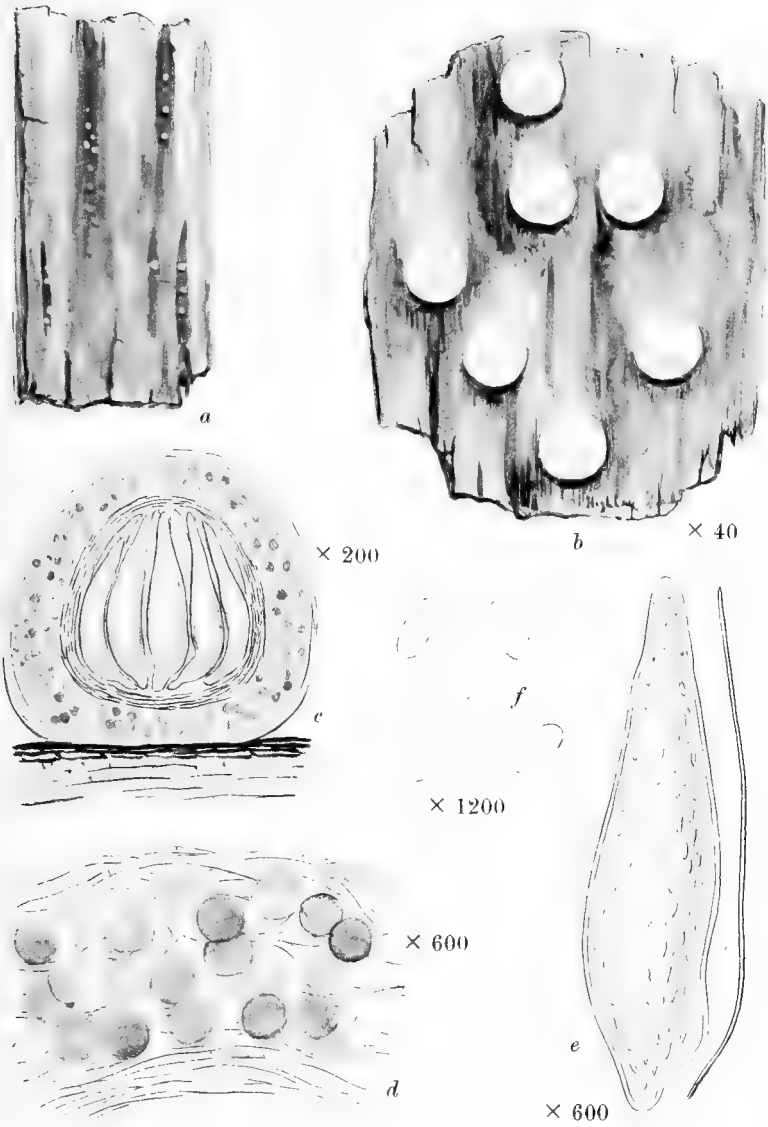

THELOCARPON LAUREREI Nyl.

a. Whole plant. *b*. Perithecia. *c*. Vertical section of perithecium. *d*. Section of perithecial wall. *e*. Ascus and paraphysis. *f*. Spores.

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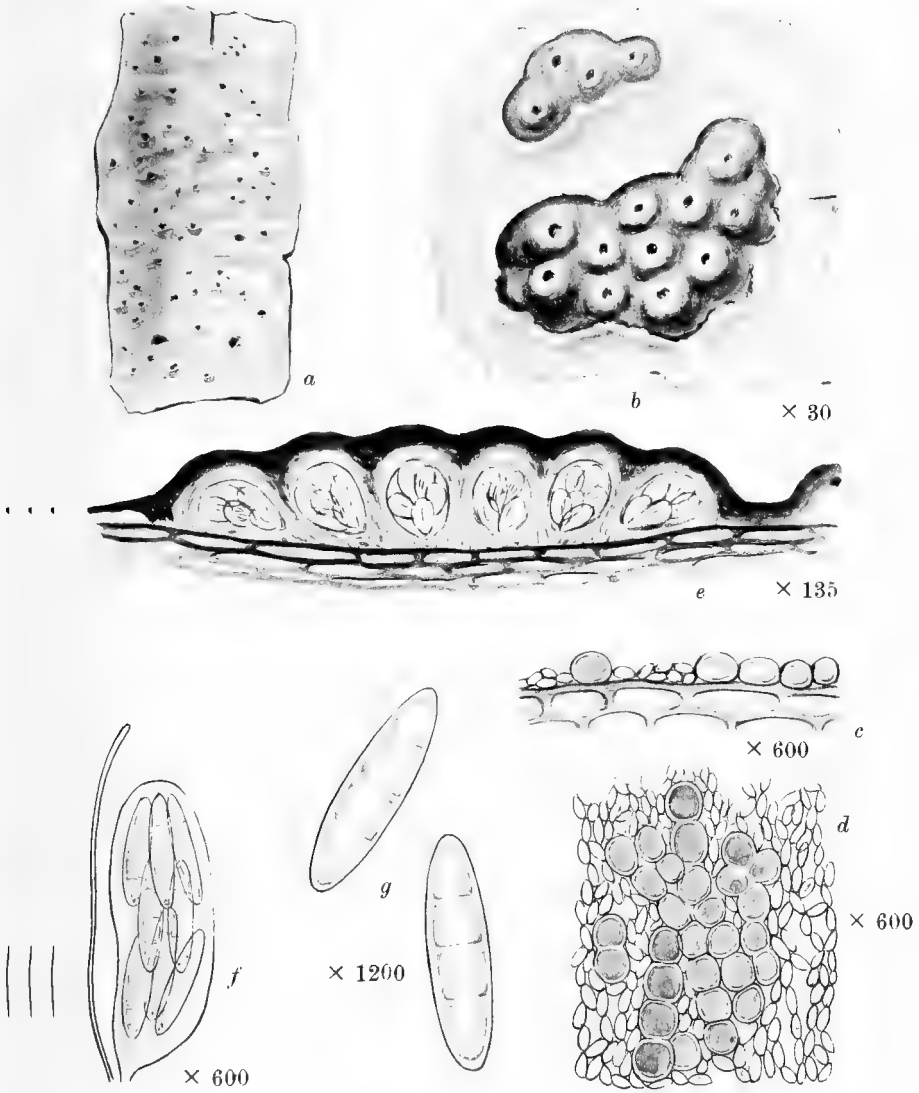

MELANOTHECA GELATINOSA Nyl.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Thallus in surface view. *e*. Vertical section of perithecia. *f*. Ascus and paraphysis. *g*. Spores.

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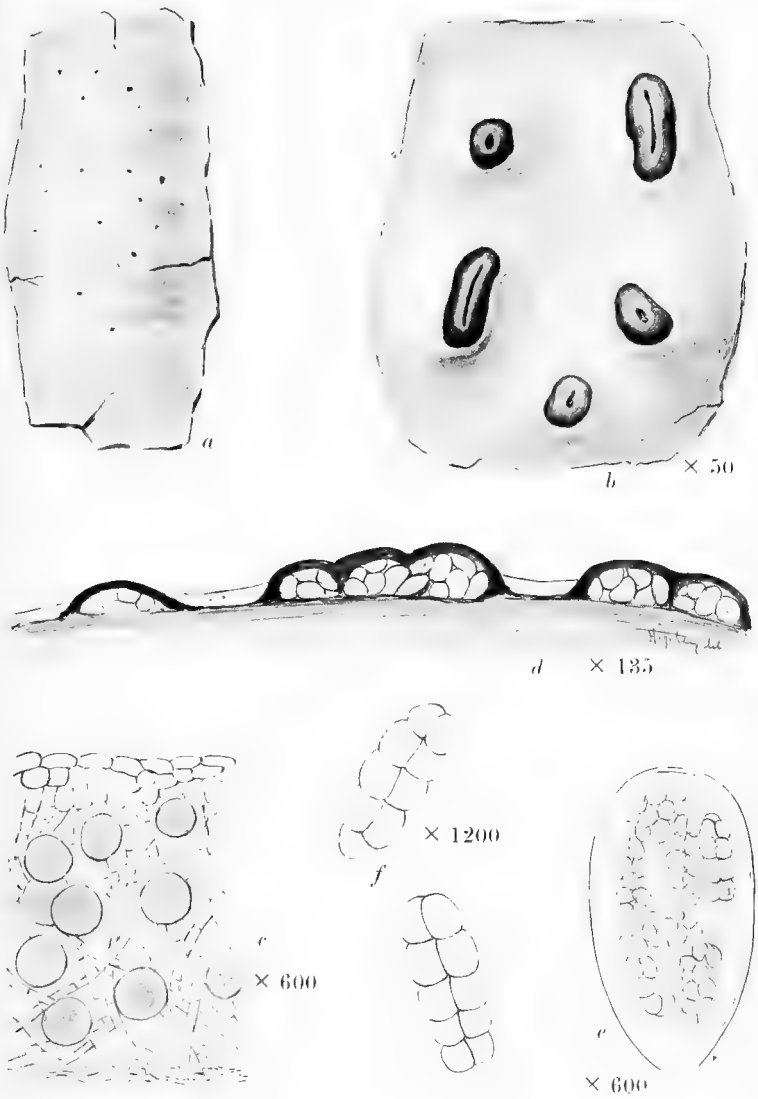

MYCOPORUM MISERRIMUM Nyl.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Vertical section of perithecia. *e*. Ascus. *f*. Spores.

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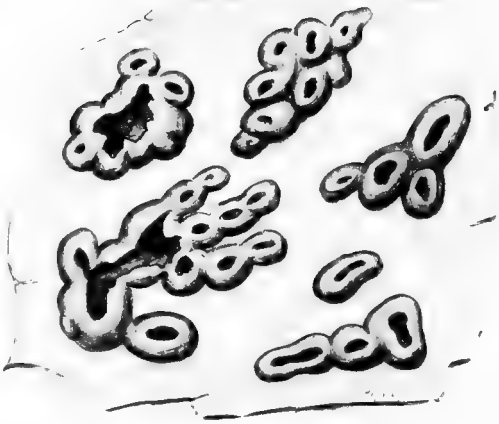
a

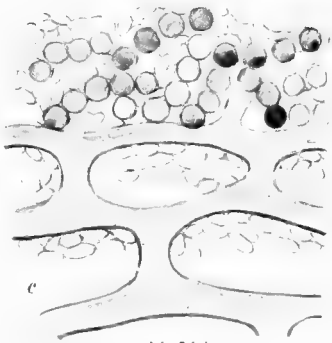


b × 20

d × 100

× 600

× 1200



× 600

MYCOPORELLUM OBSCURUM A. L. Sm.

a. Whole plant. *b*. Portion of thallus and perithecia. *c*. Vertical section of thallus. *d*. Vertical section of perithecia. *e*. Ascus and paraphyses. *f*. Spores.

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No. 21.

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